DECEMBER 1971

rsc

RAILWAY SYSTEM CONTROLS

CF 73 G SS
R R TAYLOR
40 WEST ROAD
LOMBARD ILL 60148

East Los Angeles yard: UP applies minicomputer

RACO®

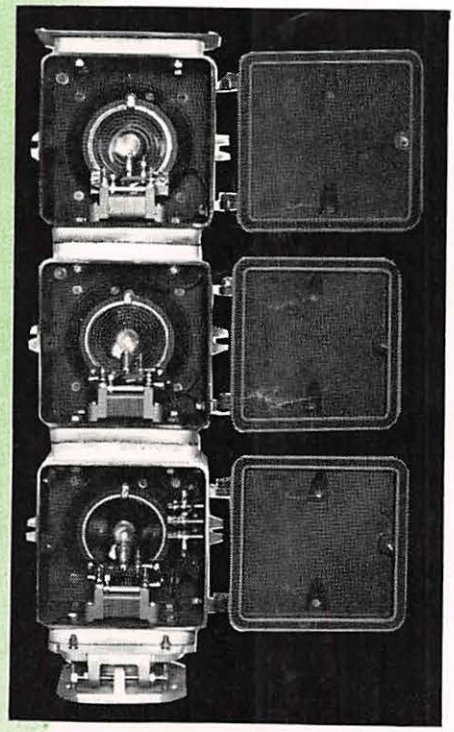
MODEL CLS-10

ALL ALUMINUM

COLOR LIGHT SIGNALS

DESIGNED FOR

MAXIMUM BEAM CANDLEPOWER



MODULAR DESIGN

The RACO CLS - 10 is available in 1, 2, 3 or more unit packing for vertical or horizontal mounting.

RACO CLS-10

signal head is easily ranged, aligned and fixed in both vertical and horizontal planes. The entire head assembly is weather tight featuring individual doors fitted with closed cell neoprene gaskets. Lenses and lamp receptacles are pre-focused and sealed at the factory to assure maximum optical efficiency.

ALL ALUMINUM

except ladder assembly which is galvanized steel, to assure long life with minimum maintenance.

LIGHT WEIGHT

offers easier handling and installation . . . cuts shipping costs too . . . the 3-unit assembly weighs less than 100 lbs.

RACO ENGINEERED to provide dependable signal indication under all operating and weather conditions.

MEETS AAR SPECIFICATIONS

MEMBER RPI RAILWAY PROGRESS INSTITUTE

For complete details contact:

Since 1920

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Railroad Accessories Corporation

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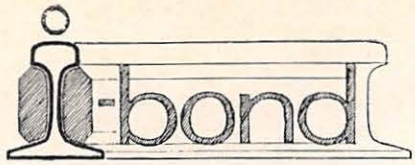
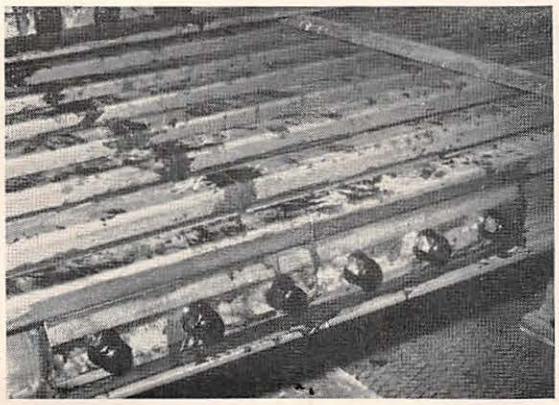
REPRESENTATIVES: Southeastern Railroad Materials Inc., 595 North Avenue N.W., Atlanta, Ga. 30318
IN CANADA: Vale Enterprises, Ltd., 1120 Claire Crescent, Lachine, Quebec
OVERSEAS: Intma International, Inc., 60 East 42nd Street, New York, N. Y. 10017

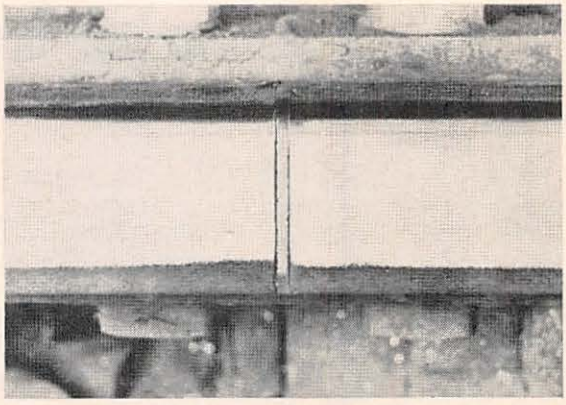
Circle 1 on reader service card



THE PERFECT INSULATED RAIL JOINT



I-BOND ASSEMBLIES DURING CURING STORAGE



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OVER 200,000 JOINTS IN SERVICE-MOST OVER 10 YEARS

3 YEAR WARRANTY

The I-Bond insulated rail joint was developed in 1956 by Ing. H. Schmitz of the German Federal Railways, specifically for use in welded territory. This insulated bonded joint, known in Europe as the "S"-type insulated bonded joint, is the insulated rail joint being used in continuous welded territory with most European railroads and industries.

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North America under license and supervision from

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Circle 4 on reader service card

The first data modem was built by gosh-knows-who. This one's built by who-knows-how.

For 75 years, knowing how has been a company tradition as well as an engineering principle at Stromberg-Carlson. And a lot of our know-how is built into our S-C 835 75-, 110-, and 150-baud data modems.

Know-how creates: *simplified speed change.* The flexibility of our design of the 75-baud unit allows the basic modem to be adapted to 110 baud by a simple change of the filters. Changing from 75 or 110 to 150 baud necessitates only the change of the filters and the receiver assembly.

Assured long-term maintenance-free performance. The S-C 835 design, up to telephone-industry standards, results in gear that's at home in any environment. A modem that will perform with consistent excellence for you year after year.

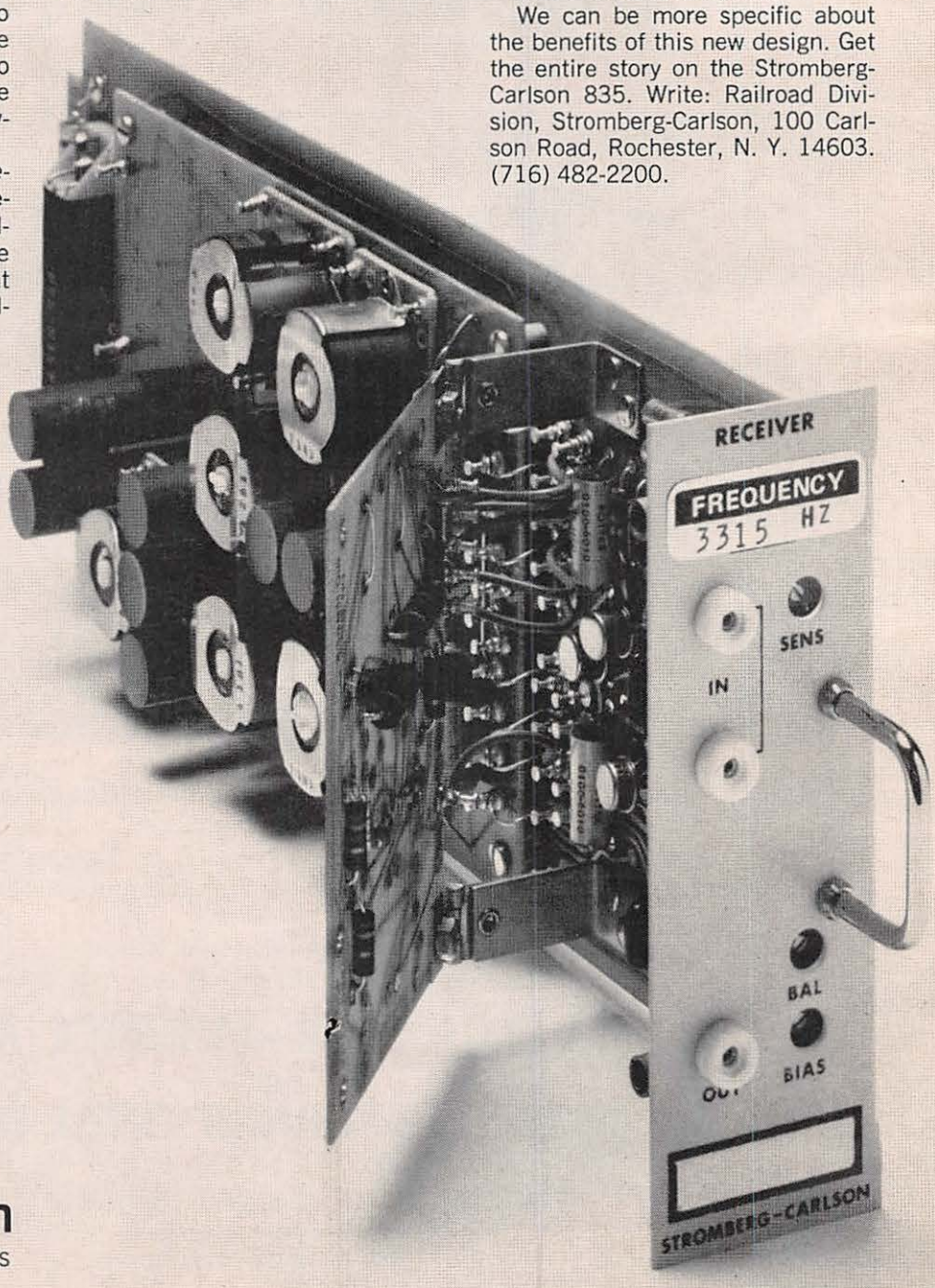
Space-saving functional integration. The interface card, mounted on the transmitter and receiver assemblies, eliminates separate space-consuming interface cards.

Lower power consumption and heat dissipation. A combination of solid-state and integrated circuits that lowers power consumption and heat-dissipation requirements, pushing reliability up and bringing equipment size down.

Ease of testing and line-up. Controls and test points are located on the front of the units, to facilitate alignment and testing of the equipment while it's working.

And you'll like the price.

We can be more specific about the benefits of this new design. Get the entire story on the Stromberg-Carlson 835. Write: Railroad Division, Stromberg-Carlson, 100 Carlson Road, Rochester, N. Y. 14603. (716) 482-2200.



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A Subsidiary of General Dynamics

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YOU SAVE HALF!

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Now you and your associates may personally subscribe to RAILWAY SYSTEM CONTROLS either at home or office.

You know how important it is that the "new crop" of men in your department be familiar with RAILWAY SYSTEM CONTROLS. That is because this magazine is the best source of information about their work. It sharpens their skills by informing them how men on other roads tackle and lick the same problems which beset them.

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DECEMBER 1971 VOL. 2 NO. 12

RSC RAILWAY SYSTEM CONTROLS

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News Briefs

N&W men learn about computers from IBM

Norfolk & Western management personnel have attended a specially tailored IBM course to learn first hand the functions and potential of computer systems. The educational program which takes one week, has been going for several months and over 100 N&W managers, from top level executives to trainmasters, have attended the school. Classes are held at Roanoke at either a hotel or motel and instructors come from IBM Education Center in Washington, D.C.

Robert W. Claytor, executive vice president, N&W, instituted the educational program in February of this year. The original five-day seminar has been condensed to meet N&W requirements into four days and nights. Three men from IBM bring equipment and text books to Roanoke. N&W men come from all over the system. These men have been personally approved by Claytor to attend the seminar. Between February and August of this year, 106 students have participated in seven classes.

Although there is a general mixture of management personnel, the program is slanted primarily to operating department men.

The opening session on a Monday morning features Claytor introducing the IBM instructors and outlining the purpose of the course for students. Supervisors from N&W's computer services department periodically monitor the seminar and are available on the first two nights at the N&W computer center where students are instructed on the use of computers. On Friday, the last day of the seminar—there have been four days of work—the computer services staff conduct an open forum answering questions from students which deal specifically with N&W operations.

Osaka subway joins CTC and computers

A new centralized traffic control system for trains has been delivered by Hitachi, Ltd. to the Osaka Municipal Transportation Bureau. Scheduled for installation after final tests, the system is built around Hitachi's process control computer Hidio-100. It is designed to control and supervise all operations in the subway line.

Tied in with the computer is a color CRT character display unit and typewriters. Main functions of the new system will include control of routes and wayside signals; automatic encoding of train running numbers; the scheduling of extra trains during peak traffic periods and modification of normal schedules; automatic data recording of train runs.

Components of the system include: the central processing unit (cubicle type) with a magnetic core memory with a capacity of 16K words; a supplementary memory magnetic drum (cubicle type) with a capacity of 128K words; a process input-output unit. Digital input—1,664. Digital output—800; console input-output unit with a console typewriter and photoelectric tape reader; logging typewriter (IBM-735); CRT character display viewer—16 lines, 640 letters, electronic keyboard; operation director's control panel and a 10 KVA power generator.

NO terminal gets new signaling

General Railway Signal Co. is furnishing a new control machine for the northeast interlocking tower at New Orleans Terminal, New Orleans, La. to control an interlocking used jointly by the Southern and the Louisville & Nashville. The new machine will consolidate the functions of three previous machines, controlling ten switch locations by type J code system and two by direct wire.

GMA seeks federal aid for aci network

The General Managers' Association of Chicago has applied to the Federal Railroad Administration for monetary assistance in installing its Chicago Area aci interchange and information system. "The demonstration of this pilot terminal information system's capabilities can serve the government as a model for similar systems in all other railroad terminals in the country," stated the GMA transmittal letter to John W. Ingram, FRA Administrator. "This proposal contains an invitation to the Government to join with the 30 Chicago railroads in establishing the pilot project for terminal interchange and information systems."

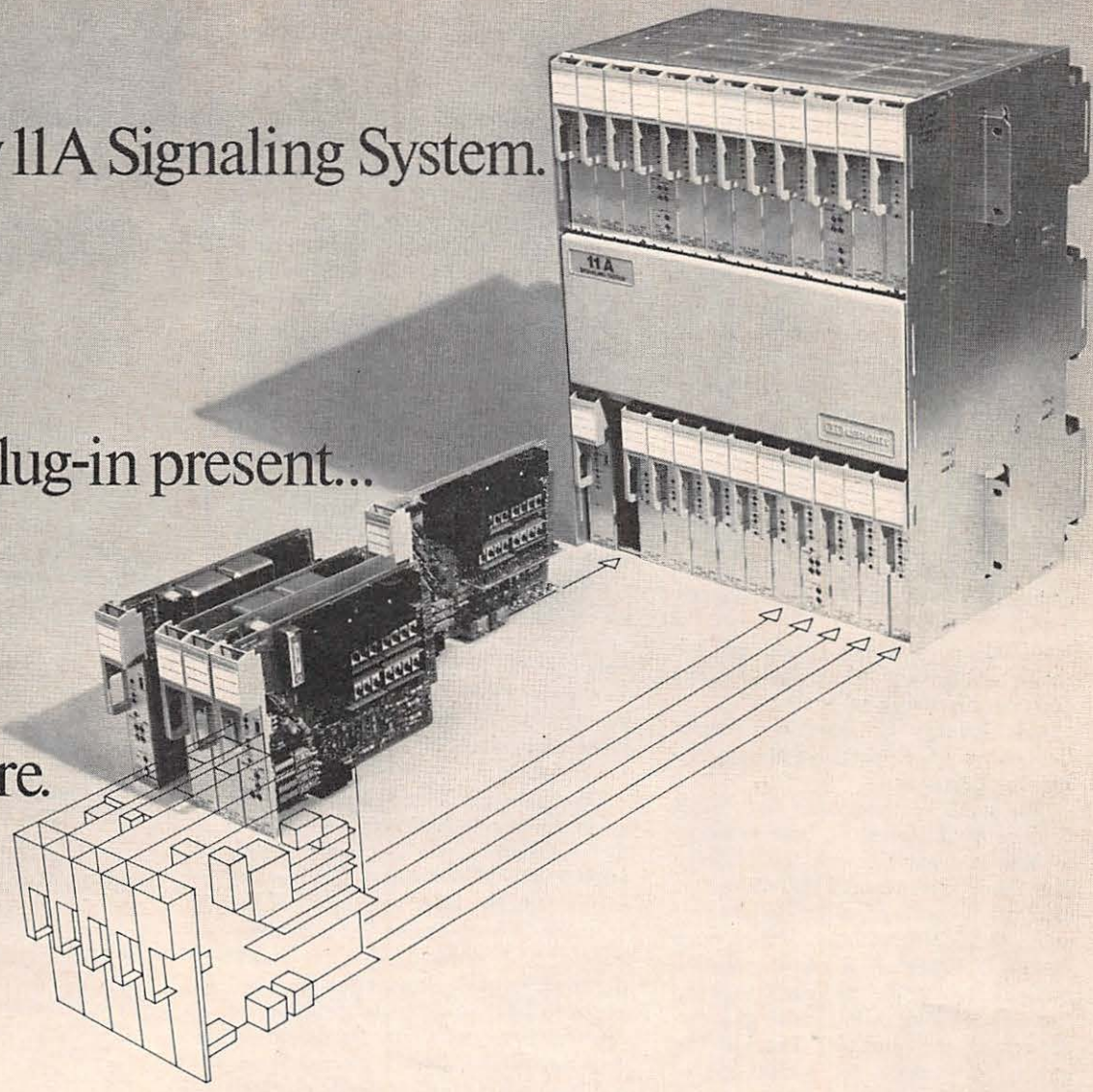
The cost of installing and operating the system over a 5-year period is estimated at $10,750,000. Total benefits for a 5-year period are estimated to be $14,327,000. Costs for aci scanners, site preparation, computers, software and implementation expense total $4,886,900, and it is this amount which GMA is asking for from FRA as a one-time funding project.

The General Managers Association of Chicago has designed and developed the means of collecting train and car movement information as the activities are occurring, on 17,410,500 freight cars per year that originate, terminate or move through the Chicago Terminal.

This means of data collection is pos-

(Please turn to page 8)

The new 11A Signaling System.



With a plug-in present...

and future.

The 11A offers a simple solution to your complex signaling requirements.

Interchangeable, plug-in units for E&M, loop, and foreign exchange (FX) signaling are available now. And more low-cost, plug-in signaling options will be announced in the near future, giving even more versatility to this already versatile system.

Additionally, every 11A offers built-in features like terminating units, precision switchable attenuators, transmit and receive pulse correction, and our exclusive Calling Party Forced Release (CPFR) at no extra cost.

And Trunk Make-Busy (TMB) is an option on most 11A units.

All of these in-band signaling options are compatible with GTE Lenkurt systems and similar Western Electric E&F type signaling.

We think no other system can match our present or future 11A in versatility, flexibility, and price.

If you're still not convinced, phone us and we'll tell you more about the new 11A: Atlanta (404) 261-8282 / Chicago (312) 263-1321 / Dallas (214) 363-0286 / Falls Church (703) 533-3344 San Carlos (415) 591-8461.

Or write, GTE Lenkurt Incorporated, Department C720, 1105 County Road, San Carlos, CA 94070.

GTE LENKURT

NEWS BRIEFS

(Continued from page 6)

sible by the locating of 109 automatic car identification scanners (electronic optical devices) at 40 sites adjacent to tracks connecting 100 freight yards, served by 30 railroads in the Chicago Terminal. Each time a train passes one of these scanner sites, the information represented by red-white-blue labels on the side of the rolling stock, and other cargo containers in view on cars, is read by the optical scanner and transmitted to a central computer for processing with other detail information furnished by the 30 railroads.

This system was designed because of the real need of railroads jointly addressing themselves to the terminal problems of:

—Congestion in yards and on routes connecting various yards and railroads.

—Lack of communication of advance and current information on cars and trains between railroads.

—Availability of reliable information on cars for operating and record keeping purposes.

The goals of the system are to (1) Reduce by 2 hours the time required to handle a car through the Chicago Terminal; (2) Increase the utilization of equipment equivalent to making available 3,975 additional cars each year; (3) Establish a communication network to enable railroads to keep surveillance over rolling stock and cargo containers; and (4) Provide the means to increase the utilization of manpower.

The major objective of the system is to provide railroads with accurate, detail, and timely information on cars and trains. The attainment of this goal will benefit the public and shippers. For the public, the improvement in railroad service will provide an incentive for new companies to locate, and present industry to remain in the area. This will furnish the means of employment, services, and products to the public, and offer a strong revenue source in support of government. Reduce congestion on city streets and expressways through interchange of trailers via rail rather than over street. Minimize inconveniences to the public at rail grade crossings.

The improvement of overall service will account for the reduction of 775,000 days per year in the transportation of products to the consumer. The GMA system will increase by 20% the railroads capability of furnishing the right quantity, and type of cars the shipper has requested when needed. The railroads will be able to furnish timely and reliable information to the shipper. This information will assist the shipper in maintaining control over inventories of material and product.

The benefits to the Chicago railroads by reducing 1 hour per car per day will have the effect of yearly car hire savings equal to $2,568,046, and will result in increased equipment availability to the owner. The benefit to the railroads in the utilization of additional man hours involved in clerical record keeping, train and yard service per year is equal to $2,209,-939. The railroads ability to provide greater dependability in their service, to the shippers will help attract new sources of revenue, and protect existing income. Annual projected savings are $4,777,985.

The GMA plan provides the government with a working model of railroad terminal operations applicable to all terminals in the country. Offers a pilot project for a beginning in the development towards a unified national network of railroad train and car information. Provides an opportunity for government to assist the railroads in the maintenance of a strong national rail network.

One time funding requested of the goverment is $4,886,900, and cost to 30 railroads over 5 years totals $6,239,000. The request for funding is based on the fact that not all of the railroads have the same financial capabilities. The railroads due to benefit the most from the system are the least likely to be in a financial position of contributing sufficient funds to its start up. The roads with a stable financial base have pressing needs that call for the utilization of available capital on their own railroads thus precluding any of their assumption of the less financially capable roads' share in the installation of the system.

Computers can aid special agents

Computers can assist special agents doing railway police work in several ways, said William J. Dixon, president, Rock Island Lines, at the recent annual meeting of the Police and Security Section, AAR. A computer can

—Extend, or substitute for, certain capabilities of the special agent.

—Provide full time, round-the-clock monitoring, reporting, recording, and controlling functions.

—Make information available quickly.

—Assist in the detection of incidence patterns or trends.

In drawing upon the capabilities of an electronic data processing system utilizing a computer, the special agent

(Please turn to page 10)

Servo is the world's leading producer of electronic hot box detector systems.

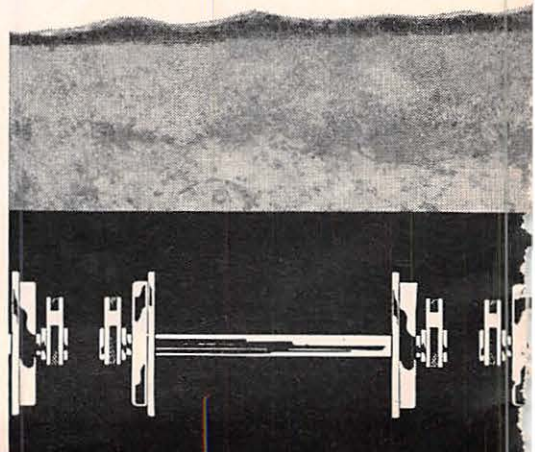
We're not experts in every phase of railroad safety—but as the industry's pioneer designer and producer of electronic hot box detection systems, we can claim a high level of successful experience in working on the problems of bearing failures, axle burn-offs and derailments associated with undetected hot boxes.

Since 1957, more than 1,600 SERVOSAFE Hot Box Detective Systems have been put into service by 54 of the world's major railroads, and have compiled an unequaled record of safety improvement, more efficient preventive maintenance procedures and cost reduction.

Hot box detectors available from Servo offer the widest flexibility in choice of system configuration, features and functional options, including: rail-mounted or ballast-mounted scanner; a complete selection of ancillary and test equipment; solid-state electronic signal processing. Several modes of data read-out are also available—automatic digital read-out at trackside or remote location; pen-paper recorder chart for visual interpretation; FM carrier data transmission over unlimited distances.

With our broad range of products and world-traveling network of field engineers, we can readily "customize" the design, manufacture, installation and operation of a SERVOSAFE system to best meet the particular requirements of your railway.

You are invited to contact us for complete descriptive literature, or to arrange a field engineering site survey and application review—without obligation, of course.



Circle 7 on reader service card

Hot box hide-n-seek. A dangerous game.

Hot box hide-n-seek is an old game — as old as railroading itself. And the villain in the game is the overheated journal that you can't find until it's too late — that's when it worsens into a really dangerous axle burn-off and costly derailment!

The safe way to beat the hot box at its own game is with a SERVOLARM® Model 8000 Trackside Hot Box Visual Display System. Designed to operate with any SERVOSAFE® Hot Box Detective™ System, the SERVOLARM visually signals the presence of a hot journal box and also pinpoints its location. SERVOLARM helps to eliminate train stops and crew delays. It simplifies and speeds up the entire hot box location procedure by directly notifying the crew via a trackside bi-directional display board — a digital readout shows the axle count location of the hot box. If there are no hot boxes, the display board reads "000."

SERVOLARM can be quickly and easily installed with a minimum of construction equipment and labor, while eliminating long distance wiring and extensive communication equipment costs.

If you're looking for an easier and safer way to win the game of hot box hide-n-seek most of the time, take a look at SERVOLARM.

Train crew on the Cincinnati-Atlanta line of the Louisville & Nashville Railroad gets the "OK" signal from a SERVOLARM Trackside Hot Box Visual Display.

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25 YEARS OF SERVING SAFETY THROUGH SCIENCE

NEWS BRIEFS

(Continued from page 8)

will be interested primarily in information which the computer generates. Sensor based computers can trigger immediate actions of various kinds, such as sounding alarms or activating data recorders. One of the most interesting applications is called the "Routemaster," an electronic device mounted in a truck containing a computer produced tape in which the specific delivery route of the truck has been preprogrammed. If a hijacker attempts to drive away with a truck so equipped, as soon as he strays very far from the designated route, warning lights flash and a buzzer sounds. Unless the truck is stopped at once, a companion device disables the engine and sets off an alarm. Another application which should have some appeal to railroad security forces is one in which a sensor based computer monitors the movements of guards or patrols by sensing the locations of badges and checks these against a predetermined schedule in the computer file.

Coming back to the use of computer data processing for the benefit of the special agent, Dixon described these applications:

"The provision, automatically, of information on freight cars moving over the railroad with contents of high value or which for any reason require protection or precautionary measures. Based on the schedules of trains in which such cars would be expected to move, the computer could give the security forces their routes and estimated time at which they would reach particular terminals. Similarly, information could be generated on cars carrying hazardous cargos for ready reference in the event of derailment or other emergency.

"Statistical analysis of criminal activities on the system, including, for example, the incidence and patterns of theft or vandalism in terminals or even at particular locations in terminals.

"Planning the assignment of security forces, including random patterns of surveillance based, perhaps, on a statistical prediction of outside intrusion potentially harmful to the railroad.

"Recording information to assist in pinpointing the occurrence the repetition, and the cause of freight loss and damage and the development of methods to reduce or eliminate the cash drain resulting therefrom. The ever increasing proportion of freight revenues siphoned off by this unproductive expense is one of the biggest problems facing the railroads to-day. The talents of railroad security forces coupled with the skills of loss and damage prevention experts, using analytical techniques made possible by the computer, can go a long way toward bringing this problem under control.

"The entry of key data on persons identified as involved in criminal activity on the railroad or developed in the course of investigations, for ready retrieval on proper authority as required.

"Provision of links to computer and communications networks of governmental law enforcement agencies as well as other railroads. For example goods stolen from railroads might be identified on inquiry as having been recovered by the law enforcement agencies or persons apprehended in a harmful act against the railroad might be found to have a record of earlier offenses" Dixon said.

"One more application, while not unique to railway police work, would prove useful to the chief special agent. This is computer assisted instruction for new personnel or for refresher courses. The use of the computer as an educational device is growing in value and importance and should be particularly adaptable to training in the investigative and security field. In computer-assisted instruction the student and computer have a learning dialogue talking to each other. This kind of instruction might be potentially useful in teaching special agents investigative techniques or in broadening their knowledge of law. Once again this would require the special agent to work closely with the programmer to develop an appropriate teaching procedure" Dixon said.

T&P opens automatic classification yard

Centennial Yard was formally opened Sept. 8. It is one of the most strategic points on the T&P-MoPac, located on both the east-west transcontinental route and the busy north-south lines of the railroads. Capacity of Centennial yard permits classification of 3,000 freight cars daily. Operation of the new yard is controlled by a digital computer. Advantage of the digital computer is that it not only permits better classification of cars, but it also has a memory bank which enables it to perform many other clerical and operating functions. It will, for instance, provide a perpetual inventory of cars and make instantly available, information about all cars in the yard.

In the future, MoPac officials will program the computer to keep a daily inventory on the exact location and other information on every freight car the railroad has in the Fort Worth-Dallas area.

RF&P installs on-line computer system

Richmond, Fredericksburg & Potomac is installing an on-line computer system to simplify the locating of freight shipments. A National Cash Register Century 100, installed last year, is being supplemented with a Century 200. NCR 260 thermal data terminals will serve as a communication link to and from the Century 200 computer for railroad personnel. The 260 terminals feature a print by heat instead of impact method of providing information.

Paris transit orders two new computers

The Paris transit authority, Regie Autonome des Transports Parisiens (RATP), has ordered a Honeywell dual-configuration series 6000 computer system. The twin model 6050 systems will be used for a variety of management, technical and scientific applications as RATP continues its planned program to develop an integrated telemanagement system. The logistics to be handled by the system include:

—Scheduling 3,600 subway cars on 550 trains running every two minutes on 145 miles of rails;

—Handling administrative records of 38,000 employes, of which more than 28,000 are RATP agents.

Initial applications will cover three broad categories: stock management of the central spare parts depot; scientific and technical research accomplished by the RATP Technical Bureau, and personnel administration.

The initial configuration will include two central processors each with 163,840 words of main memory, 16 magnetic tape drives, two high-capacity disk storage sub-systems, three printers and a Datanet 355 communications processor.

Southern to install ctc on 55 miles

General Railway Signal Co. has received an order from the Southern to furnish equipment to extend a traffic control system 55 miles from Berwin, Ga. to Jersey, Tenn. The control center, in Atlanta, Ga., will be linked to the field locations by system 4000 high speed, solid-state code system, superimposed on microwave. The extension will add twelve control points to the system.

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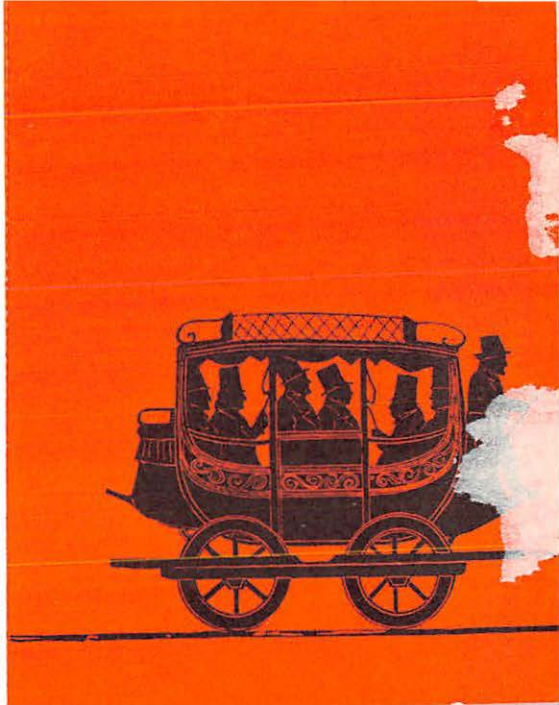
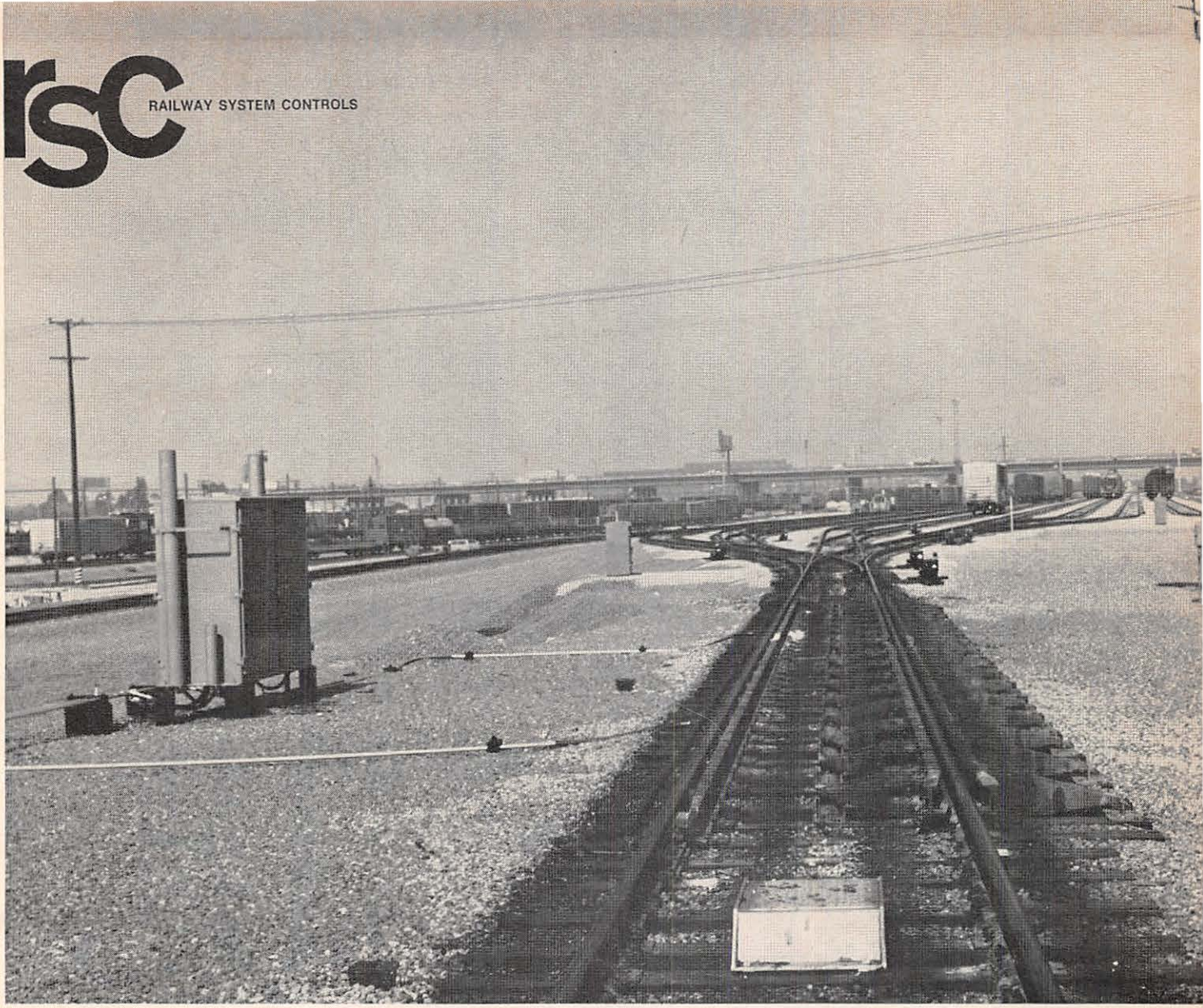




RADAR UNIT (center foreground) is used to measure speed of cars moving into group retarder.

Minicomputer controls UP yard

Since June 1971, Union Pacific's East Los Angeles yard has been operating in a "highly satisfactory" manner say UP officials. This operation is the result of mini-computer control of automatic car routing, retardation and data generation on cars handled in the 16-track classification yard. Prime contractor for the minicomputer control system was General Railway Signal., which also furnished the retarders, switch machines, signals, etc.

East Los Angeles yard is a gravity type car classification yard. It has a relatively low crest, 7.5 ft above the exit point for the group retarders. There are 16 classification tracks, divided into two equal groups, with a total class track capacity for 471 cars. Individual track capacities range from 19 to 44 cars. The yard operates on a 24-hour basis. Average traffic is 400 to 500 cars per day, and humping speed is normally about four cars–separate cuts–per minute.

The main function of this yard is to disassemble incoming trains and block them for distribution to area industries and other railroads. Mainline incoming traffic is from Pocatello, North Platte, Chicago, Kansas City, St. Louis, and Omaha. Local incoming is from the harbor, including overseas containers, from area industries, and from the Santa Fe, the Southern Pacific, and the Los Angeles Junction Railway. No particular lading predominates; loads encompass a wide assortment, including hides, chemicals, building materials, scrap metals, and autos, to name a few.

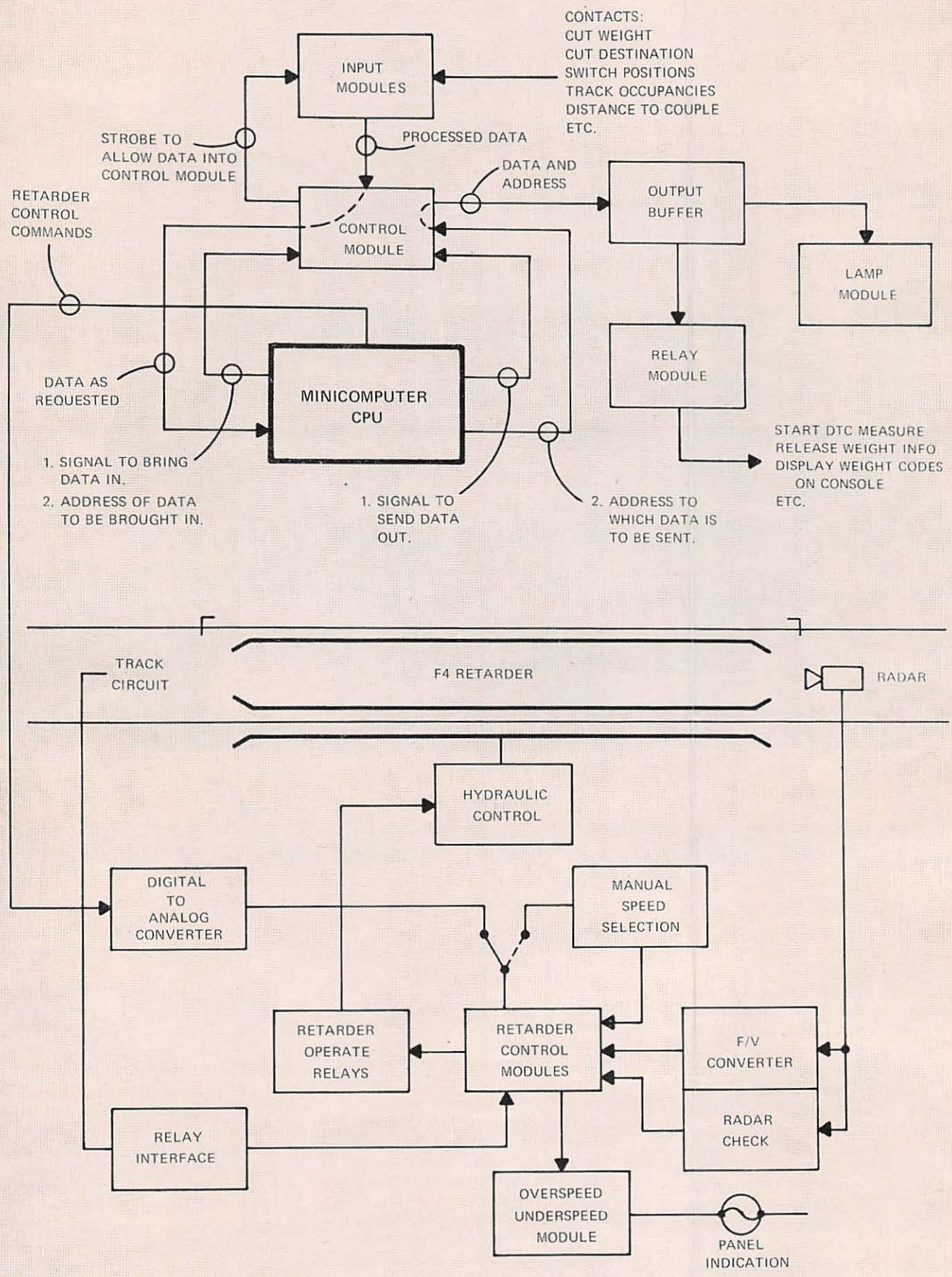
At the yard office, at the west end

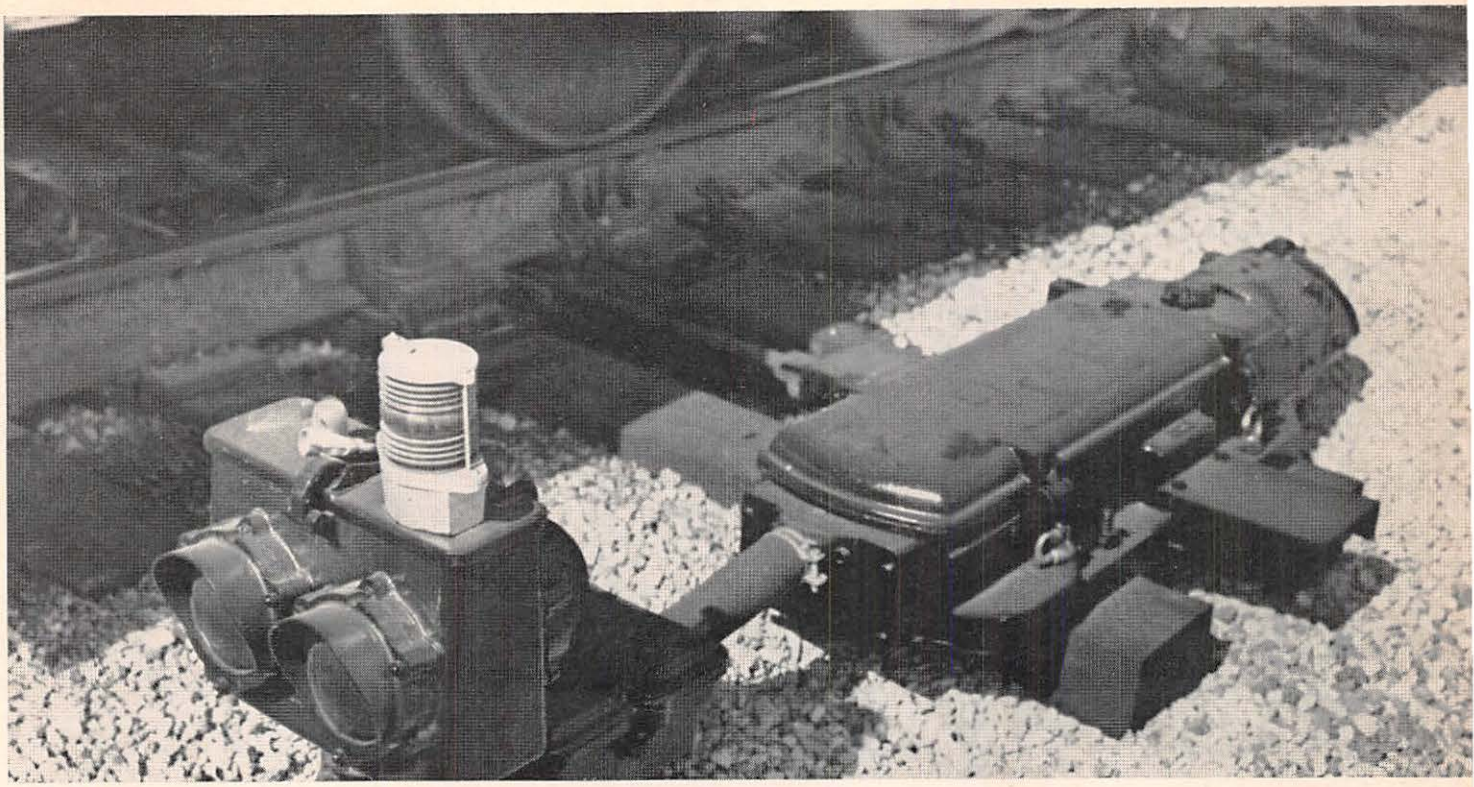
MANAGEMENT INFORMATION

At a 16-track classification yard in East Los Angeles, Calif., the Union Pacific has applied a minicomputer for control purposes. The system provides automatic car routing, car retarder operation and data generation on cars handled in the yard.

Average traffic handled is 400-500 cars daily, and humping is carried out at about four cars–separate cuts–per minute.

The minicomputer is a high speed, 16-bit process control computer. It is mounted on slides for easy access to all printed circuit boards.


INPUT MODULES
CONTACTS:
CUT WEIGHT
CUT DESTINATION
SWITCH POSITIONS
TRACK OCCUPANCIES
DISTANCE TO COUPLE
ETC.
STROBE TO ALLOW DATA INTO CONTROL MODULE
PROCESSED DATA
DATA AND ADDRESS
OUTPUT BUFFER
RETARDER CONTROL COMMANDS
CONTROL MODULE
LAMP MODULE
RELAY MODULE
DATA AS REQUESTED
MINICOMPUTER CPU
START DTC MEASURE
RELEASE WEIGHT INFO
DISPLAY WEIGHT CODES ON CONSOLE
ETC.
1. SIGNAL TO BRING DATA IN.
2. ADDRESS OF DATA TO BE BROUGHT IN.
1. SIGNAL TO SEND DATA OUT.
2. ADDRESS TO WHICH DATA IS TO BE SENT.
TRACK CIRCUIT
F4 RETARDER
RADAR
HYDRAULIC CONTROL
DIGITAL TO ANALOG CONVERTER
MANUAL SPEED SELECTION
RETARDER OPERATE RELAYS
RETARDER CONTROL MODULES
F/V CONVERTER
RADAR CHECK
RELAY INTERFACE
OVERSPEED UNDERSPEED MODULE
PANEL INDICATION



POT LIGHT (over switch indicator lights) shows when switch can't be operated.

of the yard, incoming cars are listed, and punched cards are generated for each. Tracks are assigned, most commonly according to a preestablished pattern, for example: Santa Fe to track 2, L.A. Jct. to track 11, SP to track 4, etc. Switching lists and punched cards are sent to the crest office by pneumatic tube. A clerk, working on the other side of the cars from the pin puller, staples the appropriate punched card on each car.

The master and group retarders are weight-automatic, single-rail, hydraulically operated GRS type F4. The master retarder occupies 41 linear ft; the groups occupy 71 ft each. Standard GRS radar measures speeds in all three retarders. A dragging equipment detector, a weight detector, and a photoelectric long cut detector, precede the master retarder. There is a single-rail, weight-automatic skate retarder, at the end of each class track, a type F4, the same type as used in the master and groups, but inert instead of hydraulically operated. Switch machines are GRS model 6, trailable, high-speed electrics. All class tracks are equipped with special circuits to indicate track fullness (distance to couple) information which is used by the automatic retarder control computer and is also available as a readout on the crest office as an assist to planning yard operations.

A single console in the crest office has all input and supervisory controls and readouts. In addition to the standard hump and trim ground signals, each of the two pusher locomotives has a radio controlled cab signal. The cab signals are controlled from the crest console to indicate Fast, Medium Fast, Medium, Medium Slow, Back, and Stop.

Track selection is the conventional pushbutton type with a lighted digital display with capacity to show four selections. The control console has a track diagram with indication lights for car and switch positions and with levers for positioning switches manually, if desired, instead of automatically. The track diagram has levers for opening or closing the retarders manually, as well as pushbuttons for semiautomatic operation for any of three retarder exit speeds: Slow, Medium, or Fast.

The major part of the control equipment—the minicomputer and its interface modules, the automatic switching, power supplies, batteries etc.—are housed in a building about midway between the master and group retarders and on the opposite side of the tracks from the crest office. This building also contains the hydraulic pumps, and the maintainer's facilities.

The electro-hydraulic retarder control valves and hydraulic accumulators are housed in steel cases near their respective retarders.

The minicomputer is a high speed, 16-bit process control computer. It is mounted on slides for easy access to all printed circuit boards. The entire computer is contained on four circuit boards, which can be changed out in a few minutes. Access to the computer is either through a teletypewriter or by means of switches and lights on the computer front panel. The teletypewriter is capable of reading and punching paper tape—the usual form of program loading.

Each of the GRS interface modules contain printed circuit boards, each of a standard size, 5" x 2 7/16". There are only sixteen different board types used in the entire interface, making it easy and economical to maintain a complete inventory of spares. All modules are plug coupled, and any one can be removed from its rack in a few minutes.

Each module is wired for its full capacity even when this capacity is not used. This means any desired expansion at a later date would be only a matter of plugging in the additional boards required. All wiring on the back plane was done with wire-wrap techniques—a method more reliable than conventional point-to-point wiring.

The minicomputer is a highly reliable system element. It has a high mean time between failures—thousands of hours. This reliability, coupled with the speed with which the minicomputer printed circuit boards can be changed out, made it unnecessary to provide a standby minicomputer for this installation.

Figure 1 shows the retarder control racks and identifies the various modules. Figure 2 diagrams the operation of the retarder control system. In this particular installation, the minicomputer cpu controls the retarders through the digital-to-analog converter, supplying signals to the retarder speed control modules. This method was selected as being most practical for this installation because it is well adapted to controlling hydraulic retarders and to providing—in addition to the automatic retarder control—the options of full manual control and of pushbutton speed selection control. It should be noted that it is also practical—particularly with all-electric retarders—to control retarders directly through the relay module.

In this installation, the cpu conducts all its communications through the control module (with the exception of the retarders).

The cpu, under program control, sends a message to the control module to send out a control or to bring in data, telling the control module the address for the control or the query, as the case may be.

Data, commonly in the form of contact positions (track and retarder occupancies, switch positions, cut destinations, distance to couple, etc.) are brought into the input module. This installation uses two input modules, each an 8 x 8 matrix, so that the two modules represent an array of eight 16-bit computer words. When the cpu program reaches a point where a switch or a relay contact, for example, must be checked, it sends the address of the group containing that switch or contact to the control module. It then instructs the control module to bring in the data at the address by generating a "strobe" signal to the inputer module at the address selected. The strobe allows the information at that address to pass through to the cpu.

The cpu sends commands out, such as: to cause the distance-to-couple measurement to be made on a selected track, to reset, or release, the weight detector, to cause weight code light indications to appear on the control console, etc. The cpu sends commands out through the control module to the output buffer (to provide the necessary storage time required between cpu operating time and relay operating time) and thence to the power output module, which contains relays to control the selected outside circuits as commanded by the cpu.

The lamp module displays the information (32 bits) currently in the output buffer. The system is also equipped with a standard GRS 130-pen event recorder. This provides a continuous, permanent record of all operating events.

DISTRIBUTED COMPUTER CONCEPT IS THIRD GENERATION OF

The distributed computer concept or third generation of classification yard automation is in service at Union Pacific's East Los Angeles, Calif. yard. The DCS concept is described by Mark H. Sluis, vice-president engineering, General Railway Signal Co.

Application of the DCS concept to automatic routing or switching is not only economically competitive with the relay switching systems, but it also offers today's technology in data base establishment, with car-following, inventory, and reporting functions on a per car basis from the established data base.

This application can precisely fit the needs of an older yard or a new one. It may be commanded by the hump conductor through the conventional pushbutton input, it may be driven by punched paper tape, or it may receive its instructions from a switch list stored in a bulk storage device which is a part of this module—or which may be a part of another module.

This switching module offers the advantages of a computer-oriented system in that it implements individual car tracking—as opposed to cut tracking. This permits catch-up detection. Since it has a natural interface with at least teletype grade equipment, it may readily report its findings in sufficient detail so that immediate corrective action may be taken. And best of all, a record exists of the performance, in the form of a printout. The minicomputer in this susbsystem makes possible easy communication with other computers in a large interactive system.

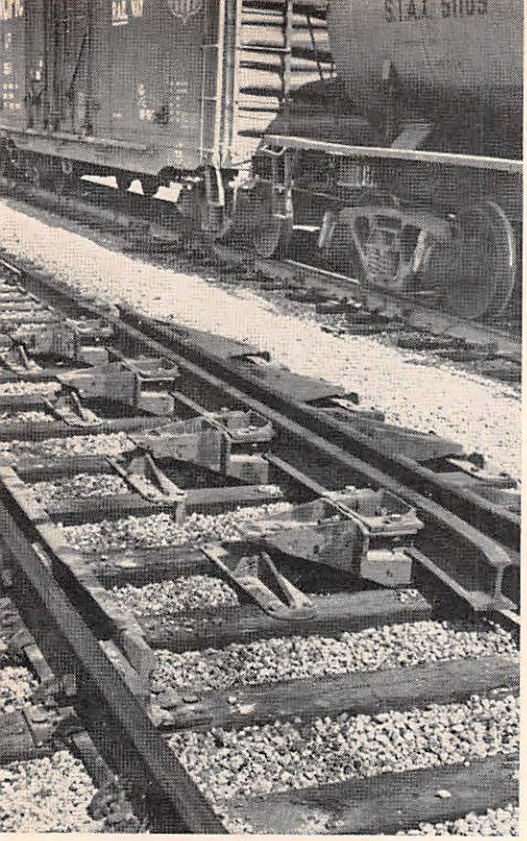
The sensory equipment used for DCS automatic switching is the conventional tracking equipment—the switch repeater contacts, zone presence detection in the switch zone (track circuit repeaters or loop circuit repeaters), and wheel detectors at the switch entrance points and at the crest. Each switch is commanded through a two-bit code.

With retarder control—automatic speed control—in the DCS concept, all of the retarders and retarder control sections in a yard can be controlled with this module. The module may be applied as a stand-alone item, in a small yard or in the updating of an older existing yard. It can also provide the primary automatic retarder control in a new, fully automated yard as a module in the interactive control system.

The minicomputer calculates the required exit speed. The most modern method of retarder control is a direct digital control in which the speed control loop is closed through the computer. The doppler radar is a digital device in the sense that it produces a pulse train at an audio frequency. With direct digital control this pulse train, along with associated pulse event times, yields direct input to the computer. The frequency, or more properly period-to-velocity conversion, is made by the mini-computer program directly, with digital computer accuracy and consistency. Note that this entirely eliminates digital to analog converters.

Direct control of the retarders is a natural digital function. The computer generates the required position codes to operate each retarder, and these codes become direct output from the computer.

Another refinement available with these third generation systems is an automatic calibration system. With the recording and storage capabilities of a computer system, observed results may be recorded and compared to the desired results. Because of the storage capabilities of the digital computer system, the necessarily long time constants may be used. With the digital distance-to-couple equipment supplied as a part of the GRS system, car velocity tracking may be extended beyond the point of tangency on the body track. In this manner one gathers visually recorded performance data



SKATE RETARDER is inert.

YARD AUTOMATION

which is directly compared to desired performance. The control parameters may then be modified to cause the observed performance to converge to the desired performance. This is made a continuous, on-line function—part of the process control.

The fourth major "mini-module" provides an inventory and reporting subsystem. This module communicates not with the process to be controlled, but rather with the process controller modules. The business data processing and information retrieval programs run in this module to achieve the requirements of inventory, reporting and supervision. Installation of this system does not compromise automatic switching or automatic retarder control.

Automatic car identification has considerable significance in a car classification yard. This module is a data concentrator built to serve up to 20 scanner decoder units over long or short distances.

During any desired modification of the DCS system, the process control modules remain operational. With the preliminary testing of raw improvements made off-line, the installation of evolutionary work can progress to the business module. If an inadvertent slip is made, the control modules can continue.

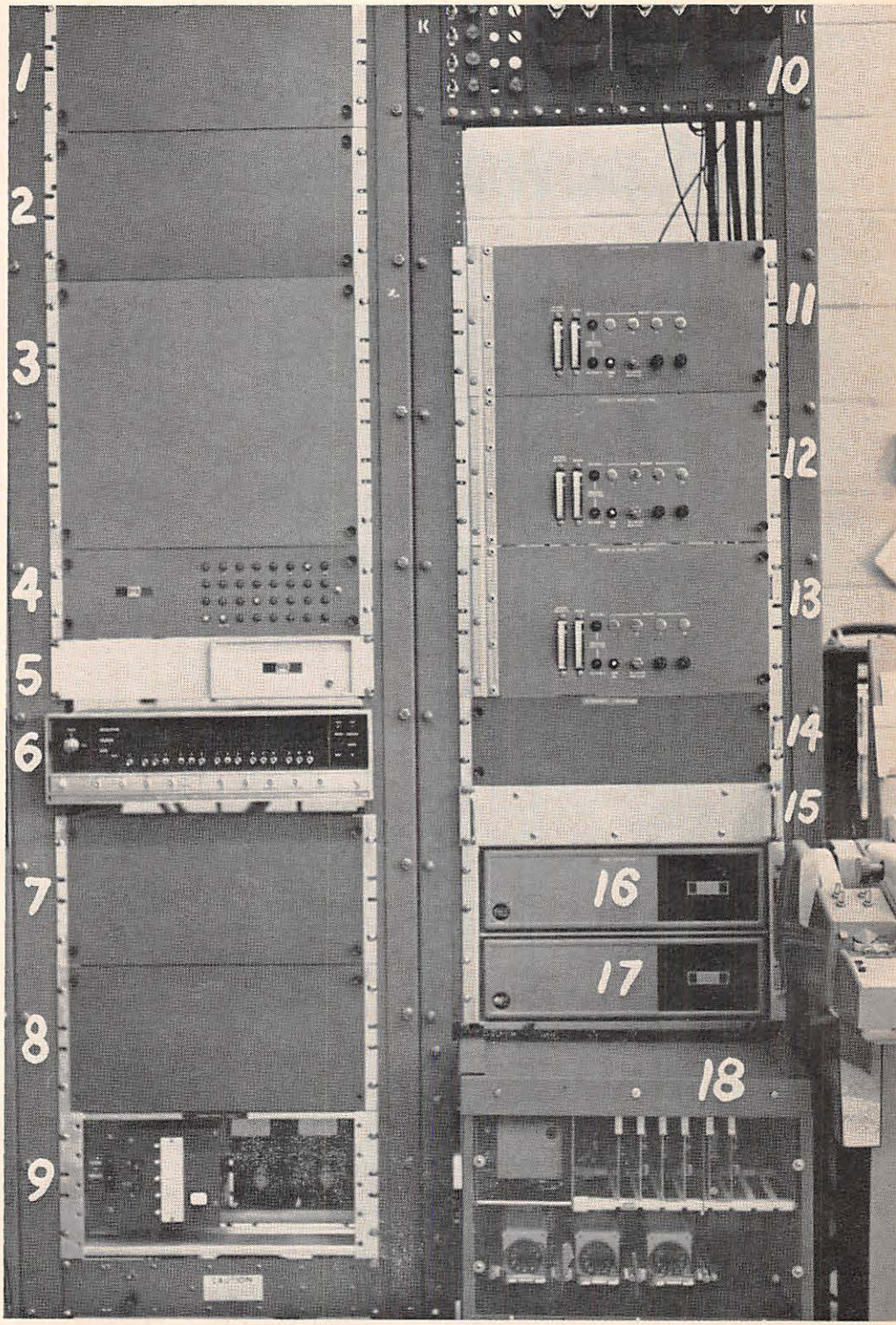


FIG. 1: RETARDER CONTROL EQUIPMENT is contained in 19" racks. Numbered items are: 1 and 2—input modules; 3—control module; 4—lamp module displays bits in buffer 7; 5—digital-to-analog converter; 6—central processing unit (minicomputer); 7—output buffer; 8—relay module (power output); 9 and 10—power supplies; 11-13—retarder speed control modules (discriminators) for, respectively, master retarder, group one retarder and group two retarder; 14—overspeed-underspeed module; 15—power supply for wheel detector; 16—wheel detector module; 17—distance-to-couple module; and 18—frequency-to-voltage converter for radar speed measurements.

LI achieves radio and power control

Two major projects—two-way radio and electrification—are well along toward completion on the Long Island. By the end of this year LI's new power control and display board should be controlling 119 route miles of the road's third-rail electrification system. Another 12.5 miles of electrification is now being constructed from Hicksville to Pinelawn on the main line and to Northport on the Port Jefferson branch. The new control system will put the entire third rail, plus 83 power substations that will serve the territory by the end of 1971, under direct remote control of the new power directors office in Jamaica. In this office a new control panel 5.5 ft tall, 17 ft long and 8" thick displays 5,700 field conditions.

On the board's face is a maze of black lines and squares and other symbols representing the third-rail system and the substations. Tiny lamps spotted on the board light up when something goes wrong. The appropriate light pinpoints for the men on duty—the load dispatchers and power directors—the location and nature of any trouble. The board monitors nine electric substations and is capable of indicating a total of 5,700 conditions in the field.

In front of the board are two standard office size desks, each with a console on top, each with 117 buttons which enable the dispatchers and directors to immediately control 3,500 functions.

Not all functions are under remote control yet, since some of the older substations are still manually controlled. Manual operations will be phased out when the entire substation network is completed. Meantime, the power directors office is connected by radio to the manned stations.

By the end of 1971, the timetable of construction calls for the old 38-station network to have been expanded to 83 stations, including 15 rebuilt ones and 45 brand new ones, all of which will then come under Jamaica's direct control. The new stations are silicon rectifier types (no moving parts) housed in compact black steel structures, with metal gridworks adjoining. Older stations contain rotary converters and are housed in larger, brick structures.

The new stations have a higher reliability than the old. Rather than install one large capacity transformer-rectifier unit to convert incoming voltage down to third-rail requirement, two smaller-capacity units are contained in the new stations. Should one fail, the other will be able to carry part of the load so that trains will be able to operate at full speed over the area supplied by that substation, losing only the ability to accelerate at a high rate from a stop.

Completion of the 83-station network will see voltage stepped up to enable the new Metropolitan fleet to operate as close as possible to its full capability. The new 100-mile-per-hour cars will then be able to accelerate and decelerate much faster than even now. At present they are utilizing only about half of their potential accelerating and decelerating ability.

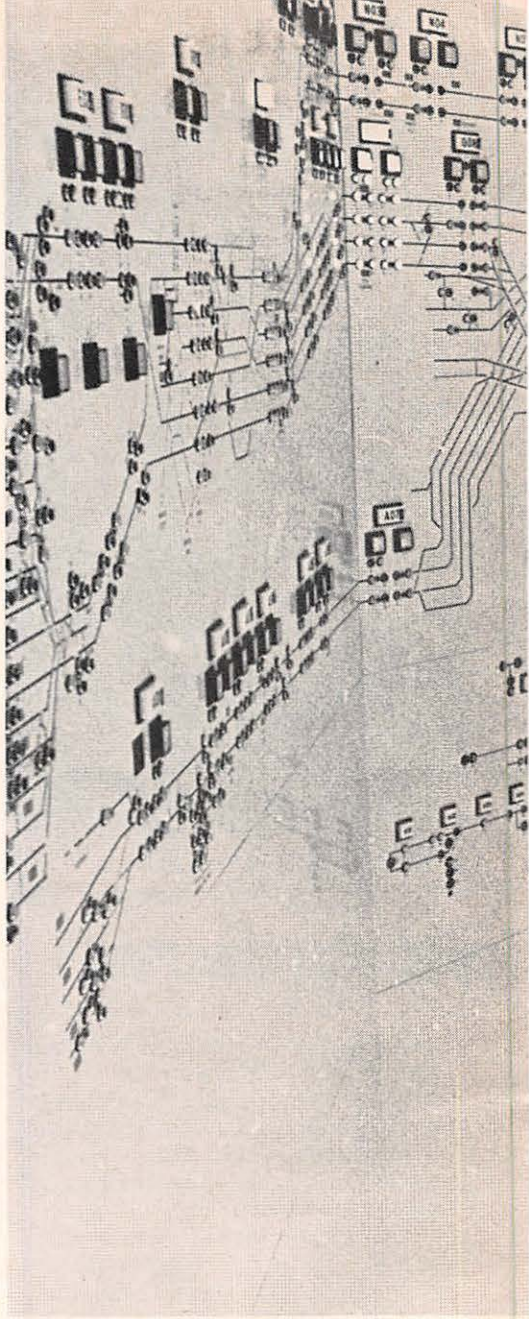
The railroad's power requirements have increased appreciably with the new Metropolitan cars and power consumption of the thirdrail territory is presently averaging around 25 million kilowatt hours a month—up about 5 million from a year ago. Completion of the 83-station power network will push this even higher.

The board and auxiliary gear cost $1.2 million, not including the installation cost. It was built by American Chain & Cable Company's Bristol division in Glen Cove, Long Island to specifications drawn up by Parsons, Brinckerhoff, Gibbs & Hill.

The display board originally was intended to be twice as long as its present 26 ft, but Don Aiken, the LIRR's assistant superintendent-signal & electric traction, worked out a simpler board. As he pointed out: "It controls so many conditions and would have required so many indicator lights that we would have needed a 10-ton air conditioner to keep the room cool."

VHF radio operational

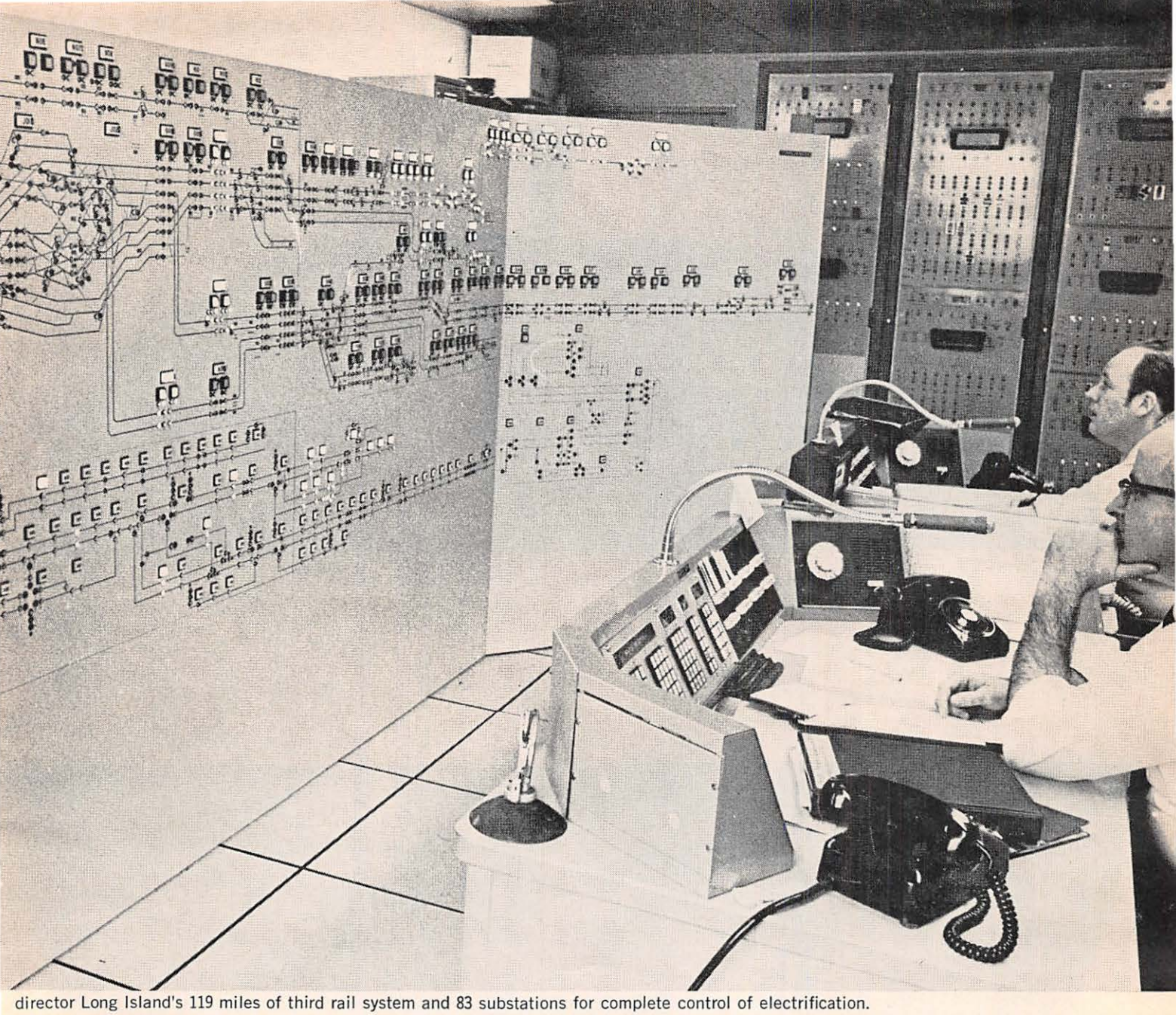
The other major project on the Long Island is its four new VHF radio systems which are now completely operational. The widespread radio network costing about $800,000 has been the special project of radio engineer Jo-



POWER CONTROL BOARD shows power

MANAGEMENT INFORMATION

Long Island has 119 miles of electrified territory including 83 substations under centralized control from its Jamaica headquarters. Also, LI's four VHF radio systems are now operational providing communications for railroad police, maintenance of way personnel and train-to-wayside for operating crews and supervisors.



director Long Island's 119 miles of third rail system and 83 substations for complete control of electrification.

seph Gagne. The four systems each, complete and distinct, operate in the 160 MHz band and are used as follows:

1) Police Department (all vehicles, walkie talkies, pocket pagers).

2) Maintenance of Way No. 1 (communications, electric traction, substations, signals).

3) Maintenance of Way No. 2 (track structures, bridges, buildings, miscellany).

4) Train-to-Wayside (diesel locomotives, electric trains, both communicating direct to wayside towers and/or "204").

Each system is composed of a network of centrally located radio base stations throughout Long Island, giving complete radio coverage for the entire railroad from Brooklyn and New York to Greenport (94 miles) and Montauk (115 miles).

To use these new airwaves, two-way radios are appearing in all kinds of places which never had them before. The Metropolitan fleet—620 cars—is, of course, entirely radio equipped, right down to loudspeaker systems throughout the trains so that officials at Jamaica headquarters can even—if it is ever necessary—make direct announcements to all passengers in the moving trains.

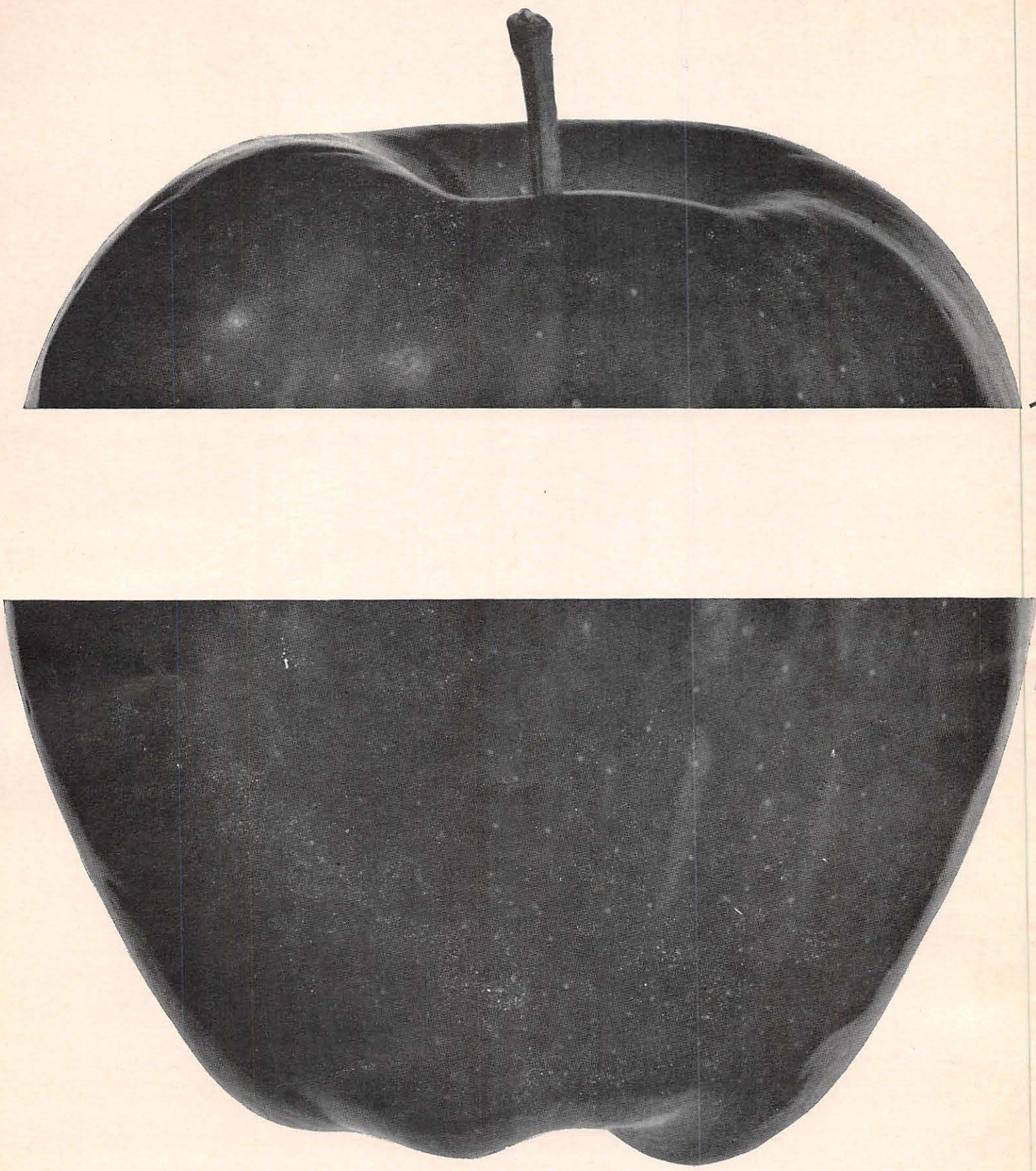
In addition to the new cars, 32 of the older Zip cars (electrics) are having radios installed in them. The diesel fleet is also being radio equipped. When eight Alco locomotives arrived a couple of years ago, they already had radios in them. Now, 43 older locomotives are getting radios.

About 125 motor vehicles (trucks and autos used by the railroad) are getting hooked up by radio. So are 23 wayside towers and block stations. These already have telephones, but in case of vandalized phones, bad weather or other emergencies, they will be able to switch to radio.

To ensure reliable operation of all this new radio gear, a complete servicing setup has been created within the railroad by Gagne. Two facilities are now open and staffed. One is in a converted 54-foot combine of the 1300 car series —a type of car no longer in active service on the railroad.

The one being used by the radio department is temporarily parked in the Johnson Avenue Yard at Jamaica, but may be moved to Babylon. This repair facility-on-wheels is referred to as the W-6 car and services all train radios. Parts, repair benches, and a full-time repair crew are found aboard the old combine.

The other repair facility takes care of all radios in the railroad's motor vehicle fleet, plus portables, pocket pagers, basic station equipment and miscellaneous, and is located in the old LIRR station on the former World's Fairgrounds in Queens.



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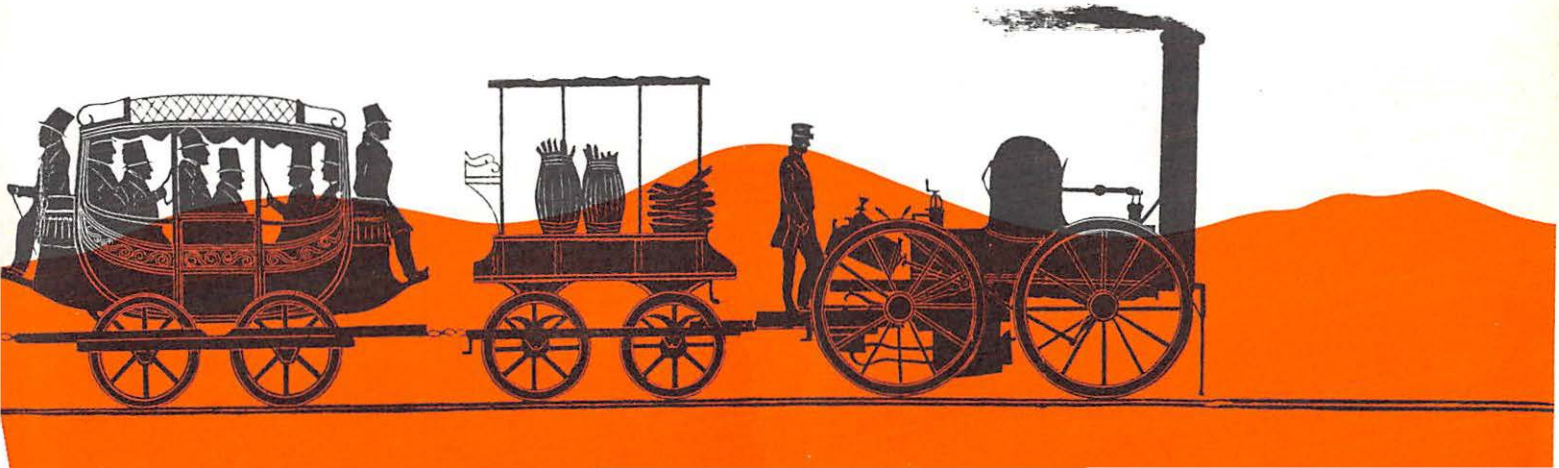

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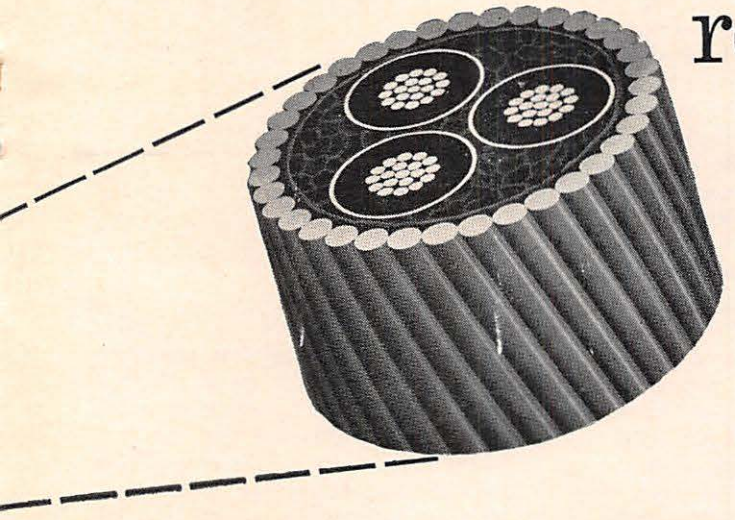

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Signal rules may be changed

Continued from November issue pages 19, 22-32.

AAR comments

FRA proposals

Words in *italic* to be deleted and words in **bold face** to be added to rules.

236.202 *Signal* **Signals** governing movements over hand-operated switch. Signals governing movements over hand-operated switch in the facing direction shall display *its most restrictive* **an** aspect **the indication of which shall not be more favorable than "proceed at restricted speed"** when the **normally closed** *points* **point** *are* **is** open one-fourth inch or more and, in the trailing direction, three-eighths inch or more, except that where a separate aspect is displayed for facing movements over the switch in the normal and in the reverse position, the signal shall display *its most restrictive* **an** aspect **the indication of which shall not be more favorable than "proceed at restricted speed"** when the switch points are open one-fourth inch or more from either the normal or reverse position.

236.203 Hand-operated crossover between main tracks; protection. At hand-operated crossover between main tracks, protection shall be provided by one of the following: (a) an arrangement of one or more track circuits and switch circuit controllers, (b) facing point locks on both switches of the crossover, with both locks operated by a single lever, or (c) electric locking of the switches of the crossover. Signals governing movements over either switch shall display *their most restrictive* **an** aspect **the indication of which shall not be more favorable than "proceed at restricted speed"** when any of the following conditions exist: (1) Where protection is provided by one or more track circuits and switch circuit controllers, and either switch is open or the crossover is occupied by a train, locomotive or car in such a manner as to foul the main track. It shall not be a violation of this requirement where the presence of sand, rust, dirt, grease or other foreign matter on the rail prevents effective shunting. (2) Where facing **point** locks with a single lever are provided and either switch is unlocked. (3) Where *the* switches are electrically locked before the electric locking releases.

236.204 Track signaled for movements in both directions: requirements. On track signaled for movements in both directions, a train shall cause one or more opposing signals immediately ahead of it to display *the* **their** most restrictive aspect, the indication of which shall *be* not **be** more favorable than "proceed at restricted

BofRS comments

236.203 Hand operated crossover; protection. At hand-operated cross-over between tracks, either of which is signaled, protection shall be provided by one of the following: (a) An arrangement of one or more track circuits and switch circuit controllers, (b) facing point locks on both switches of the cross-over, with both locks operated by a single lever, or (c) electric locking of the switches of the crossover. Signals governing movements over either switch shall display their most restrictive aspect when any of the following conditions exist:

(1) Where protection is provided by one or more track circuits and switch circuit controllers, and either switch is open or the crossover is occupied by a train, locomotive or car in such a manner as to foul the main track. It shall not be a violation of this requirement where the presence of sand, rust, dirt, grease or other foreign matter on the rail prevents effective shunting;

(2) Where facing locks with a single lever are provided, and either switch is unlocked;

(3) Where the switches are electrically locked, before the electric locking releases.

AAR comments

FRA proposals

Words in *italic* to be deleted and words in **bold face** to be added to rules.

BofRS comments

speed." Signals shall be so arranged and controlled that if opposing trains can simultaneously pass signals displaying proceed aspects and the next signal in advance of each such signal then displays an aspect requiring a stop, or its most restrictive aspect, the distance between opposing signals displaying such aspects shall be not less than the aggregate of the stopping *distances* **distance** for movements in each direction. Where such opposing signals are spaced stopping distance apart for movements in one direction only, signals arranged to display restrictive aspects shall be provided in approach to at least one of the signals. Where such opposing signals are spaced less than stopping distance apart for movements in one direction, signals arranged to display restrictive aspects shall be provided in approach to both such signals. In absolute permissive block signaling when a train passes a head block signal it shall cause the opposing head block signal to display an aspect requiring a stop.

Rule 236.205 Signal control circuits; requirements. Revise the first four lines to read as follows: The circuits shall be installed so that each signal governing train movements into a block will display an aspect the indication of which shall be not more favorable than "proceed at restricted speed" when any of the following conditions exist within the block:

236.205 Signal control circuits; requirements. The circuits shall be *so* installed **so** that each signal governing train movements into a block will display *its most restrictive* **an** aspect **the indication of which shall be not more favorable than "proceed at restricted speed"** when any of the following conditions obtain within the block: (a) occupancy by a train, locomotive, or car, (b) when points of a switch are not *closed* in proper position, (c) when an independently operated fouling point derail equipped with switch circuit controller is not in derailing position, (d) when a track relay **or any device that functions as a track relay** is in deenergized position, or when signal control circuit is deenergized.

Rule 236.206 Battery or power supply with respect to relay; location. It is recommended that this rule be deleted.

236.206 Battery or power supply with respect to relay; location. The battery or power supply for each signal control relay circuit, where an open-wire circuit or a common return circuit is used, shall be located at the end of the circuit farthest from the relay.

236.206 Battery or power supply with respect to relay; location. It is recommended that this rule be deleted.

236.207 Electric lock on hand-operated switch **and derail; control.** Electric lock **where required** on hand-operated switch **or derail** shall be controlled so that it cannot be unlocked until control circuits of signals protecting such switch **or derail** have been

236.207 Electric lock on hand-operated switch; control. Electric lock on hand-operated switch shall be contolled so that it cannot be unlocked until control circuits of signals protecting such switch have been opened. Approach or time

AAR comments

FRA proposals

Words in *italic* to be deleted and words in **bold face** to be added to rules.

opened. Approach or time locking shall be provided.

Subpart C INTERLOCKING STANDARDS

236.301 Where signals shall be provided. Signals shall be provided to govern train movements into and through interlocking limits, except that a signal shall not be required to govern movements over a hand-operated switch into interlocking limits if the switch is provided with an electric lock, *and a derail at the clearance point, either pipe connected to the switch or independently locked, electrically. Electric locks installed under this rule must conform to the time and approach locking requirements of Rule 314 (without reference to the 20 mile exceptions), and those of either Rule 760 or Rule 768, as may be appropriate.*

236.302 Track circuits and route locking. Track circuits and route locking shall be provided. Route locking shall be effective when the first pair of wheels of a locomotive or car passes a point not more than 13 feet in advance of the signal governing its movement.

Note 1: Existing installations on each railroad, which do not conform to the requirements of this section shall be brought into conformity on or before December 31, 1970. **Note—The 13 feet to be measured from the center of the mast on which the signal is mounted, or if there is no mast, from the center of the signal base.**

236.303 Control circuits for signals, selection through circuit controller operated by switch points or by switch locking mechanism. The control circuit for each aspect with indication more favorable than "proceed at restricted speed" of power operated signal governing movements over switches, movable-point frogs and derails shall be selected through circuit controller operated directly by switch points or by switch locking mechanism, or through relay controlled by such *circuit* controller, for each switch, movable-**point** frog, and derail in the routes governed by

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locking shall be provided, which shall be tested at least once a year, except that time releases and timing relays shall be tested at least once every three months. The timing shall be maintained at not less than 90 percent of the predetermined time interval, which shall be shown on the plans and marked on the time release or relay.

FRA proposals

Words in *italic* to be deleted and words in **bold face** to be added to rules.

such signal. Circuits shall be arranged so that such signal can display an aspect more favorable than "proceed at restricted speed," only when each switch, movable-point frog, and derail in the route is in proper position. *Note —Existing installations on each railroad, which do not conform to the requirements of the section shall be brought into conformity on or before December 31, 1970.*

236.304 Mechanical locking or *same* **equivalent** protection effected by circuits. Mechanical locking, or the *same* **equivalent** protection effected by means of circuits shall be provided.

236.305 Approach or time locking. Approach or time locking shall be provided in connection with signals displaying aspects with indications more favorable than "proceed at restricted speed."

236.306 Facing point lock or switch-and-lock movement. Facing point lock or switch-and-lock movement shall be provided for mechanically operated switch, movable-point frog or split point derail.

236.307 Indication locking. Indication locking shall be provided for operative approach signals of the semaphore type, *power operated home* **non-mechanical interlocking** signals, power-operated switches, movable-point frogs and derails, and for all **operative** approach signals *hereafter* installed **after October 1, 1950,** except light signals all aspects of which are controlled by coded track circuits or by double wire line circuits.

FRA proposals

Words in *italic* to be deleted and words in **bold face** to be added to rules.

236.308 Mechanical or electric locking or electric *circuits,* **circuit** requisites. *Mechanical or electric locking or electric circuits shall be installed to prevent signals from displaying aspects which permit conflicting movements except that opposing signals may display on aspect indicating proceed at restricted speed at the same time on a track used for switching movements only, by one train at a time. Manual interlocking in service as of the date of this part at which opposing signals on the same track are permitted simultaneously to display aspects authorizing conflicting movements when interlocking is unattended, may be continued, provided that simultaneously train movements in opposite directions on the same track between stations on either side of the interlocking are not permitted.*

Note: Relief from the requirement of this section will be granted upon an adequate showing by an individual carrier to allow opposing signals on the same track simultaneously to display aspects to proceed through an interlocking which is unattended, provided that train movements in opposite directions on the same track between stations on either side of the interlocking are not permitted at the same time.

Signals, when governing movements to tracks signaled beyond interlocking limit, shall be prevented by mechanical or electric locking or by electrical circuits from simultaneously displaying aspects which permit conflicting movements. At unattended interlockings opposing signals on the same track may simultaneously display aspects to proceed providing the opposing signal controls are overlapped or train movements in opposite directions on the same track between stations on either side of interlocking are not permitted at the same time.

BofRS comments

236.308 Mechanical or electric locking or electric circuits; requisites. (a) Mechanical or electric locking or electric circuits shall be installed to prevent signals from displaying aspects which permit conflicting movements except that opposing signals may display an aspect indicating proceed at restricted speed at the same time on a track used for switching movements only, by one train at a time. Manual interlocking in service as of the date of this part at which opposing signals on the same track are permitted simultaneously to display aspects authorizing conflicting movements when interlocking is unattended, may be continued, provided that simultaneous train movements in opposite directions on the same track between stations on either side of the interlocking are not permitted.

(b) Except where mechanical or or electric locking has been installed, the control machine shall be equipped with lights, which operate automatically and are continuously lighted, to indicate: (1) that power operated switch has completed its movement and is locked; (2) that hand-operated switch is in either a full normal or reverse position; (3) that controlled signals are displaying stop; (4) that track circuits between opposing signals are in de-energized position; and (5) that track circuits between adjacent controlled points in territory signaled for movement in either direction are in de-energized position.

FRA proposals

Words in *italic* to be deleted and words in **bold face** to be added to rules.

236.309 Loss of shunt at *automatic* interlocking. At automatic interlocking, a loss of shunt of 5 seconds or less shall not permit an established route to be changed.

236.310 Signal governing approach to home signal. A signal shall be provided on main track to govern the approach with the current of traffic to any home signal except where the home signal is the first signal encountered when leaving yards or stations and authorized speed approaching such signal is not higher than slow speed. When authorized speed between home signals on route governed is 20 miles per hour or less, an inoperative signal displaying an aspect indicating "approach next signal prepared to stop" may be used to govern the approach to the home signal.

236.*311* **310** Signal control circuits, selection through track relays, and through signal mechanism contacts and time releases at *automatic* interlocking. The control circuits for aspects with indications more favorable than "proceed at restricted speed" shall be selected through track relays for all track circuits in the route governed, or through repeating relays for such track relays. **Track circuit control of signals shall be effective when the first pair of wheels of a locomotive or car passes a point not more than 13 feet in advance of signal governing its movement.** At automatic interlocking, signal control circuit shall be selected **through the following:** (a) *through* Track relays for all track circuits in the route governed and **all track circuits** in all conflicting routes within interlocking limits or *through* repeating relays for such track relays. (b) *through* Signal mechanism contacts or relay contacts closed when signals for such conflicting routes display stop aspects *and* (c) *through* Normal contacts of time *releases* **release** for such conflicting routes or contacts of relays repeating the normal position of *Contacts* **contacts** on such time releases. **When electronic or other time release devices are used, equivalent protection shall be provided. Note—The 13 feet to be measured from the center of the mast on which the signal is mounted, or if there is no mast, from the center of the signal base.**

236.*312* **311** Movable bridge, interlocking of signal appliances with bridge devices. When movable bridge is protected by interlocking the signal appliances shall be so interlocked with bridge devices that before a signal governing movements over the bridge can display an aspect to proceed the bridge must be locked and the track alined with the bridge locking members within one inch of their proper positions and with the track rail on the movable span within three-eighths inch of correct surface and alinement with rail seating device on bridge abutment or fixed span. **Emergency by pass switches and devices shall be locked or sealed.**

236.*313* **312** Pipe for operating connections, requirements. Steel or wrought iron pipe one inch or larger, or members of equal strength shall be used for operating connections for switches, derails, movable-point frogs, facing point locks, rail-locking devices of movable bridge protected by interlocking, and mechanically-operated signals, except up and down rod which may be three fourths inch pipe or solid rod. Pipes shall be fully screwed into coupling and both ends of each pipe shall be riveted to pipe plug with 2 rivets. Pipeline shall not be out of alinement sufficiently to interfere with the proper operation of the interlocking, shall be properly compensated for temperature changes and supported on carriers spaced not more than 8 feet apart on tangent and curve of less than 2° and not more than 7 feet apart on curve of 2° or more. With lever in any position, couplings in pipeline shall not foul carriers.

236.*314* **313** Electric lock for hand operated switch *or derail.* Electric lock shall be provided for each hand-operated switch *or derail* within interlocking limits, except where train movements are made at not exceeding *20* **30** miles per hour. *At manually operated interlocking it shall be controlled by operator of the machine and shall be unlocked only after signals governing movements over such switch or derail display aspects indicating stop.* **Where switch is equipped with an electric lock,** *Approach* **approach** or time locking shall be provided.

RULES AND INSTRUCTIONS

236.326 Mechanical locking removed or disarranged; requirements for permitting train movements through interlocking. When mechanical locking of interlocking machine is being changed or is removed from the machine, or locking becomes disarranged or broken, unless protection equivalent to mechanical locking is provided by electric locking or electric circuits, train movements through the interlocking shall not be permitted until each switch, movable-point frog or derail in the route is spiked, clamped or blocked in proper position so that it cannot be moved by its controlling lever, and then train movements shall not exceed restricted speed until *the* interlocking is restored to normal operation. It will not be necessary to comply with this requirement at interlockings where protection is in service in accordance with section **236.**303 provided that the signal controls are arranged so that the signals cannot display an aspect the indication of which is less restrictive than "proceed at restricted speed."

236.327 Switch, movable-point frog or split point derail. Switch, movable-point frog or split point derail shall be *maintained* **installed** so that it cannot be locked *if the switch* **when the** point is *prevented by an obstruction from closing to within* **open** three-eighths inch **or more.**

236.328 Plunger of facing-point lock. Plunger of lever operated facing-point lock shall have at least 8 inch stroke. *When* **and when** lock lever is in unlocked position the end of the plunger shall **not** clear the lock rod *not* more than one inch.

236.329 Bolt lock. Bolt lock shall be so *maintained* **installed** that signal governing movements over switch or derail and displaying an aspect indicating stop cannot be operated to display a less restrictive aspect while **the** derail is in derailing position or when switch point is open one-half inch or more.

236.330 Locking dog of switch and lock movement. *Locking dog of* Switch and lock movement shall **be installed so that locking dog will** extend through lock rod one-half inch or more in either normal or reverse position.

236.331 *Repairs to* Switch and signal *valves* **valve locks, valve magnets** and cylinders. Repairs to *switch and signal valves* **valve locks, valve magnets** and cylinders shall *not* be *made while they are in service.* **Installed in accordance with the limits within which such devices are designed to operate.**

FRA proposals

Words in *italic* to be deleted and words in **bold face** to be added to rules.

236.332 *Air Distribution system; draining condensation. Provision shall be made for draining condensation out of air distribution system at low points. Condensers, tanks, reservoirs, and air distribution lines shall be drained frequently enough to avoid overflow of condensation into branch lines and apparatus.*

236.333 *Pole changer on electric switch operating mechanism. Pole changer on electric switch operating mechanism shall be maintained so that movement of switch mechanism follows movement of controlling lever.*

236.334 **332** Point detector. *Point detector shall be maintained so that when switch mechanism is locked in normal or reverse position, contacts cannot be opened by manually applying force at the closed switch point.* Point detector, *circuit controller* **when used,** shall be *maintained* **installed** so that the contacts will not assume the position corresponding to switch point closure if *the* switch point is *prevented by an obstruction, from closing to within* **open** one-fourth inch *where latch out device is not used, and to within three eighths inch where latch out device is used.* **or more.**

236.335 **333** Dogs, stops and trunnions of mechanical locking. Driving pieces, dogs, stops and trunnions shall be rigidly secured to locking bars. Swing dogs shall have full and free movement. Top plates shall be *maintained securely* **secured** in place.

236.336 **334** Locking bed. The various parts of the locking bed, locking bed supports, and tappet stop rail shall be rigidly secured in place and alined to permit free operation of locking.

BofRS comments

236.334 Point detector. Point detector shall be maintained so that when switch mechanism is locked in normal or reverse position, contacts cannot be opened by manually applying force at the closed switch point. Point detector circuit controller shall be maintained so that the contacts will not assume the position corresponding to switch point closure if the switch point is prevented by an obstruction, from closing to within one-fourth inch where latch-out device is not used, and to within three-eighths inch where latch-out device is used. In making the test, it shall be considered a violation of the rule if the switch operating rod adjustment is changed and/or anything less than full pressure of the switch movement is exerted on the switch point in an effort to achieve compliance.

FRA proposals

Words in *italic* to be deleted and words in **bold face** to be added to rules.

236.337 **335** Locking faces of mechanical locking; fit. Locking faces shall fit squarely against each other with a minimum engagement when locked of at least one-half the designed locking face.

236.338 **336** Mechanical locking required in accordance with locking sheet and dog chart. Mechanical locking shall be **installed** in accordance with locking sheet and dog chart *currently in effect.*

236.339 **337** Mechanical locking *maintenance* requirements. Locking and connections shall be *maintained* **installed** so that, when a lever or latch is mechanically locked **the** following will be prevented: (a) Mechanical machine. (1) Latch-operated locking. Raising lever latch block so that bottom thereof is within three-eights inch of top quadrant. (2) Lever-operated locking. Moving lever latch block more than three-*eighths* **eights** inch on top of quadrant. (b) Electromechanical machine. (1) Lever moving in horizontal plane. Moving lever more than five-sixteenth inch when in normal position or more than nine-sixteenth inch when in reverse position. (2) Lever moving in arc. Moving lever more than 5 degrees. (c) Power machine. (1) Latch-operated locking. Raising lever latch block so that bottom thereof is within seven-thirty seconds inch on top of quadrant. (2) Lever moving in horizontal plane. Moving lever more than five-sixteenths inch when in normal position or more than nine-sixteenths inch when in reverse position. (3) Lever moving in arc. Moving lever more than 5 degrees.

236.340 **338** Electromechanical interlocking machine; locking between electrical and mechanical levers. In electromechanical interlocking machine, locking between electric and mechanical levers shall be *maintained* **installed** so that mechanical lever cannot be operated except when released by electric lever.

236.341 **339** Latch shoes, rocker links and quadrants. Latch shoes, rocker links and quadrants of Saxby and Farmer **type** *machines* **machine** shall be *maintained* **arranged** so that locking will not release if a downward force not exceeding a man's weight is exerted on the rocker while *the* lever is in the mid-stroke position.

AAR comments

FRA proposals

Words in *italic* to be deleted and words in **bold face** to be added to rules.

236.*342* **340** Switch circuit controller. Switch circuit controller connected at the point to **a** switch, **split point** derail, or movable-point frog shall be *maintained* **installed** so that *its* contacts will not be in position corresponding to *switch* point closure when *switch* point is open one-fourth inch or more.

INSPECTIONS AND TESTS—**INTERLOCKING.**

Rule 236.376 Mechanical locking. Revise as follows: Mechanical locking in interlocking machine shall be tested when new locking is placed in service or change in locking is made. Inspection and test shall be made at least once every six years.

236.376 Mechanical locking. Mechanical locking in interlocking machine shall be tested when new locking is placed in service or change in locking is made. *Complete* **Inspection and** test shall be made at least once every *four* **five** years.

Rule 236.377 Approach locking. Revise as follows: Approach locking shall be tested at least once every five years.

236.377 Approach locking. Approach locking shall be tested at least once *a year.* **every four years.**

Rule 236.378 Time locking. Revise as follows. Time locking shall be tested at least once every five years.

236.378 Time locking. Time locking shall be tested at least once *a year.* **every four years.**

Rule 236.379 Route locking. Revice as follows: Route locking shall be tested at least once every five years.

236.379 Route locking. Route or other type of switch locking shall be tested at least once every *three months.* **four years.**

Rule 236.380 Indication Locking. Revise as follows: Indication locking shall be tested at least once every five years.

236.380 Indication locking. Indication locking *for semaphore signals and for switch or lock levers* shall be tested at least once *a year and for light signals at least once every two years.* **every four years.**

BofRS comments

236.342 Switch circuit controller. (Present rule). Switch circuit controller connected at the point to switch, derail, or movable-point frog, shall be maintained so that its contacts will not be in position corresponding to switch point closure when switch point is open one-fourth inch or more.

236.342 Switch circuit controller. Switch circuit controller connected at the point to switch, derail, or movable point frog, shall be maintained so that its contacts will not be in position corresponding to switch point closure when switch point is prevented by an obstruction from closing to within one-fourth inch or more.

236.377 Approach locking. Approach locking shall be tested when initial installment is made, when any change is made and subsequently at least once a year.

236.378 Time locking. Time locking shall be tested when initial installation is made, when any change is made and subsequently at least once a year.

236.379 Route locking. Route or other type of switch locking shall be tested when initial installation is made and subsequently at least once every three months.

236.380 Indication locking. Indication locking for semaphore signals and for switch or lock levers shall be tested when initial installation is made, when any change is made and subsequently at least once a year.

Indication locking for light signals shall be tested when initial installa-

(Please turn to page 33)

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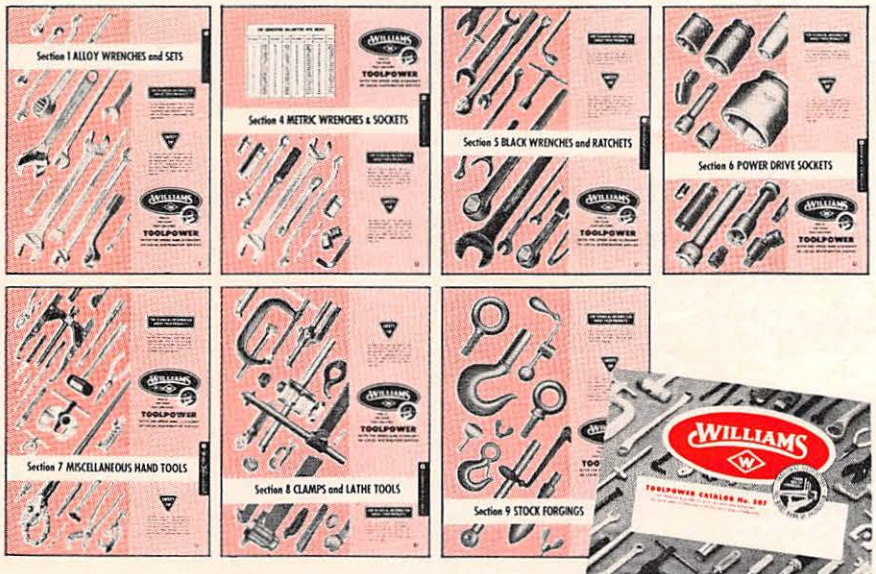
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ROCK ISLAND: R. C. **Edmondson** appointed signal supervisor, system, at Chicago. **T. F. Maske** appointed assistant signal supervisor at Liberal, Kan. **E. F. Yuknis** appointed engineer of signal design at Chicago.

SOUTHERN: N. C. **Pace,** assistant to vice-president-communications, appointed assistant vice-president communications and signals with headquarters in Atlanta, Ga.

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RS&I CHANGES

(Continued from page 30)

AAR comments

Rule 236.381 Traffic locking. Revise as follows: Traffic locking shall be tested at least once every five years.

Rule 236.382 Point detector. Revise as follows: Point detector adjustment shall be tested at least once every six months.

Rule 236.383 Valve locks and valve magnets. Revise as follows: Valve locks on valves of the non-cut-off type, valves and valve magnets shall be tested at least once every six months.

Rule 236.384 Cross protection. Revise as follows: Cross protection, when provided, shall be tested at least once every six months.

Rule 236.385 Switch, movable-point frog, split-point derail. Revise as follows: Switch, movable-point frog or split-point derail adjustment test shall be made at least once every six months.

FRA proposals

Words in *italic* to be deleted and words in **bold face** to be added to rules.

236.381 Traffic locking. Traffic locking shall be tested at least once *a year* **every four years.**

236.382 *switch obstruction test.* **Point detector.** *Switch obstruction test shall be made at least once a month.* **Point detector adjustment shall be tested at least once every three months.**

236.383 Valve locks and valve magnets. Valve locks on valves of the non-cut-off type, valves and valve magnets shall be tested at least once every three months.

236.384 Cross protection. Cross protection, **when provided,** shall be tested at least once every three months.

336.385 *Time releases and time relays.* **Switch, movable-point frog, split-point derail.** *Time releases and timing relays shall be tested at least once every three months. The timing shall be maintained at not less than 90 percent of the predetermined time interval, which shall be shown on the plans or marked on the time release or relay.* **Switch movable-point frog or split-point derail adjustment test shall be made at least once every three months.**

236.386 Restoring feature, *on power* **electro-pneumatic** switches. Restoring feature on *power switches,* **electro-pneumatic switch** shall be tested at least once *every three months* **each year.**

236.387 Movable bridge locking. Movable bridge locking shall be tested at least once **each** year.

CONTINUED NEXT MONTH

BofRS comments

tion is made, when any change is made and subsequently at least once every two years.

236.381 Traffic locking. Traffic locking shall be tested when initial installation is made, when any change is made and subsequently at least once a year.

236.382 Switch obstruction test. Switch obstruction test shall be made when switch, movement and locking device are initially installed, when adjustments, repairs, or changes are made to the switch or its related apparatus and subsequently at least once a month.

236.383 Valve locks and valve magnets. Valve locks on valves of the non-cut-off type, valves, and valve magnets shall be tested when initial installation is made, when any change is made and subsequently at least once every three months.

236.384 Cross protection. Cross protection shall be tested when initial installation is made, when any change is made and subsequently at least once every three months.

236.385 Time releases and timing relays. Time releases and timing relays shall be tested when initial installation is made, when any change is made and subsequently at least once every three months. The timing shall be maintained at not less than 90 percent of the predetermined time interval, which shall be shown on the plans and marked on the time release or relay.

236.386 Restoring feature on power switches. Restoring feature on power switches shall be tested when initial installation is made, when any change is made and subsequently at least once every three months.

236.387 Movable bridge locking and appurtenances. Mechanical rail locks, operation of circuit controllers connected to the wedges, latches, rail locks, etc., electric locks, mechanical plunger locks, and ground lever locks shall be inspected and tested at least once every three months in order to insure proper maintenance and adjustment of movable bridge apparatus.

Mechanical wedge locking and that between ground levers shall be tested at least once each year.

How to obtain maximum performance

By GEORGE STOVER
Chief Engineer
C&D Batteries

Stationary batteries which are operated under normal conditions have an extremely long life. For example, the life expectancy of lead-antimony batteries is approximately 14-16 years. The life of lead-calcium batteries is normally 20-25 years. Recent tests show that their useful life may be 30 years or longer.

To obtain the maximum performance and longest possible life from batteries, certain precautions must be taken in their installation, operation, and maintenance. By observing a few simple procedures, stationary batteries will often outlast the equipment to which they supply power. It is not unusual for an entire installation to be replaced before the battery is worn out.

Although your battery may already be installed, a few comments on the ideal installation might be helpful, in case changes are contemplated—or are possible—in your battery room.

The ideal installation for a battery is a cool, clean, dry area where the cells will not be affected by heat from the sun, radiators, heaters or pipes. Excessive heat can shorten the life of a battery considerably.

Although 77°F. is usually recommended as the temperature for a battery room, 72°F. is a preferred operating temperature for the extension of battery life. If the battery room temperature is raised from 77° to 92°F., the float (charging) current is approximately doubled, the water consumption is nearly doubled, as are grid corrosion and hydrogen evolution. Tests at the C&D Laboratories at Plymouth Meeting, Pa., have shown that at 92°F., the life of the battery is shortened to approximately one half its normal expectancy. At 107°F., the life is cut to approximately one quarter normal.

To facilitate proper maintenance and minimize temperature differentials between cells within a battery, it is advisable to limit rack height to two tiers. For added stability, two-step racks are superior to two-tier racks.

The cells should be arranged on the rack so they can be connected positive (+) to negative (—) throughout. Connections between cells must be clean, free of acid and liberally coated with No-Ox-Id grease. The lead-coated nuts should not be tightened excessively as this may loosen the threaded insert.

A simple way of checking that the cells are properly connected is to take a dc voltmeter reading of the total battery while still on open circuit. The reading should be approximately 2.05 times the total number of cells in the battery.

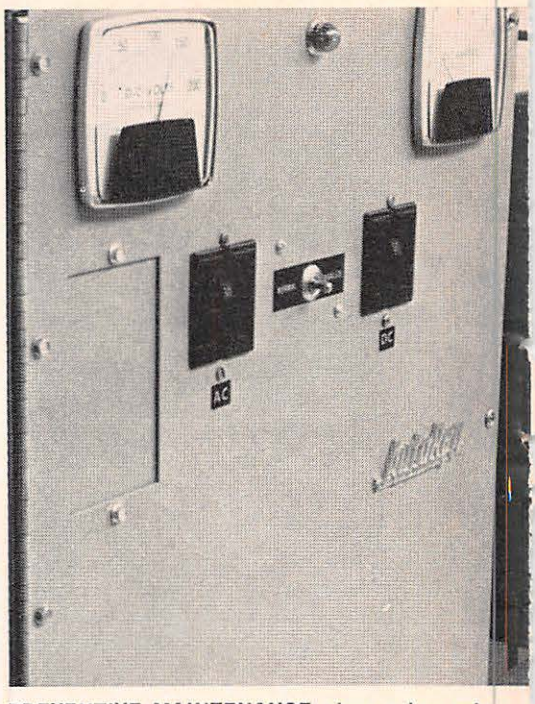
Most stationary batteries are constantly connected to vital circuits which must be energized at all times. This is accomplished by connecting the battery in parallel with a continuously operating charger and the desired load circuits. The charger is then adjusted to a voltage which will enable the battery to absorb just enough current to keep it fully charged. The charger also furnishes current for the connected load. This is called floating operation. It assures a fully charged battery, instantaneously ready for any emergency. If lead-calcium or lead-antimony batteries are floated below recommended voltage, periodic equalizing charges may be necessary.

Although a lead-calcium battery will float normally at a charge voltage of 2.17 volts per cell (vpc), it may require occasional equalizing charges during its life. At 2.20 vpc, no equalizing charges will be required, and neither the capacity nor the life of the lead-calcium battery will be affected by this higher voltage. Therefore, it is desirable to operate lead-calcium batteries at 2.20 to 2.25 vpc if the associated equipment can tolerate this voltage.

Lead-antimony batteries, when they are new, will normally remain fully charged if floated at 2.17 vpc. However, as the batteries age, periodic equalizing charges will be needed. When the float voltage is lower than 2.17 vpc, even new batteries need equalizing. If the voltage is significantly more than 2.17 vpc, corrosion of the positive plates is accelerated, thereby shortening the life of the lead-antimony battery.

Equalizing charges are given at a higher voltage than the floating voltage. Their purpose is to compensate for any irregularities which may occur, such as low-floating voltage due to faulty adjustment of the charger or an improperly calibrated panel voltmeter. An equalizing charge is also used in restoring the battery to full charge in a minimum time after an emergency discharge.

Lead-antimony batteries require an equalizing charge approximately every 3-6 months. Lead-calcium batteries do not need equalizing charges if they are floated at the recommended values of 2.20- to 2.25-vpc. However, if they are operated at the minimum of 2.17-vpc, they should be given an equalizing charge whenever the lowest cell drops more than 0.04 volts below the average float voltage for the string.



PREVENTIVE MAINTENANCE plays a key role

Stationary batteries—especially lead-calcium—require a minimal (yet extremely vital) amount of maintenance in order to insure dependable operation and long life.

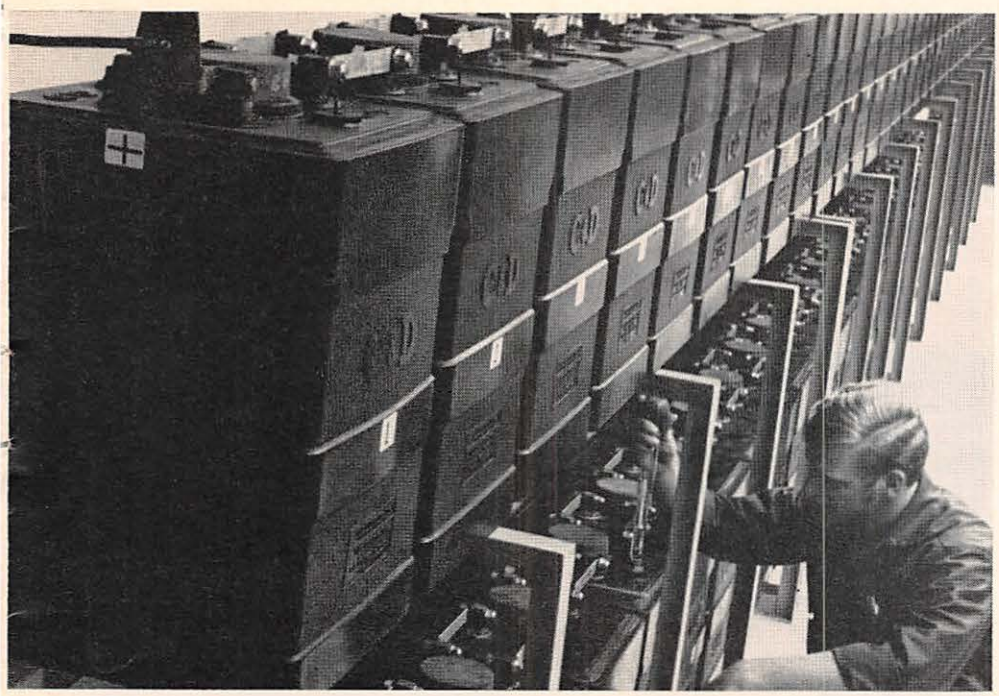
Water normally evaporates in a battery. In addition, a small amount of the water in a sulfuric acid electrolyte is broken down by the charging current. It is important to add either distilled or approved water to the cells to keep the electrolyte level between the HIGH and LOW level marks.

Lead-antimony batteries begin their life with a relatively low water consumption. As the batteries age, this consumption will increase until, at the end of life, they will require approximately ten times as much water as they did when they were new.

Lead-calcium batteries, on the other hand, initially require only one-tenth the amount of water as do new lead-antimony batteries. This low requirement remains constant during their entire life, and is one of the reasons why they are preferred for hard-to-reach locations such as microwave installations on pipe lines or railways.

When water is added to a cell, it does not mix immediately with the electrolyte and a hydrometer reading taken at this time will not indicate the true specific gravity of the electrolyte in the cell. It is advisable to wait several days before taking hydrometer tests after water additions to lead-antimony bat-

from stationary batteries



in obtaining maximum performance from batteries.

teries. Several weeks should pass before testing lead-calcium cells in float service.

Specific gravity is a measure of the weight of the electrolyte relative to water. For example, 1.210 specific gravity means that the electrolyte is 1.210 times heavier than the corresponding volume of water.

When taking hydrometer readings, always hold the hydrometer svringe vertically and make sure that the indicator is floating freely when there is no pressure on the bulb. As the battery discharges, the hydrometer will float lower because the specific gravity decreases. When recharged, the specific gravitv will return to its original value. A hydrometer reading, therefore, is an indication of the charged or discharged condition of a cell.

One cell in a battery is often taken as a pilot cell for recorded readings. Such readings should be taken daily in manned stations and as frequentlv as possible in remote installations. Since all cells in a series-connected battery experience equal amounts of charge or discharge, their specific gravities will rise or fall together.

A gradual lowering in the specific gravity of the pilot cell is an indication of insufficient charge caused by low floating. Ordinarily, when the "float" charge is correct, the hydrometer reading will stay close to the maxium value for that cell.

As mentioned earlier, variations in hydrometer readings occur when water is added. Temperature variations also cause changes in hvdrometer readings as the volume of the electrolyte is affected. The normal cell temperature is 77°F. If the electrolvte temperature is above this point, the hydrometer readings may be corrected bv adding one specific gravity point (.001) for each three degrees above 77°F. Conversely, if the electrolyte temperature is below 77°F., the hydrometer reading may be corrected to 77°F. by subtracting one specific gravitv point (.001) for each three degrees the temperature is below 77°F.

Hvdrometer readings are also affected by the electrolyte level. If the electrolyte level is at the full mark, its specific gravity is 1.210. It will read approximately 15 points (.015) higher, or 1.225, if the level, after charging, has lowered by ½" due to evaporation losses.

The following table illustrates how the hydrometer readings of the electrolyte will vary at different temperatures and for different levels in the same fully-charged cell.

The outside walls of the cells should be wiped with a damp cloth to remove dust and dirt. If electrolyte is spilled on the cover, it should be wiped off with a cloth moistened in a solution of ½ pound of baking soda dissolved in one quart of water.

For a battery to perform properly on float or discharge, it is essential that all battery connections be clean, tight and free of corrosion. The posts, bolts and connecting surfaces should be free of acid and well-coated with No-Ox-Id grease. Periodic checking and tightening of the connections should be part of the routine maintenance.

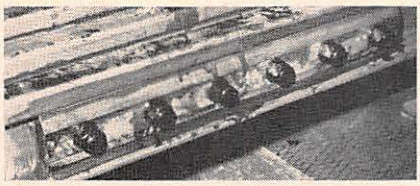
A record of the battery's operation, condition and maintenance is very useful in assuring good performance and long battery life. Report forms can be recommended by the manufacturer. If the simple elements of *a good installation, proper float* voltage, the use of *an adequate charger, watering, clean posts* and *general good housekeeping* are observed, stationary batteries—especially lead-calcium batteries—will, give the user many years of dependable service.

- Stationary batteries offer an extremely reliable reserve power supply. To attain this reliability, it is important that the batteries are properly installed and properly maintained.
- For maxium life, the battery should be installed in a cool place and all cells kept at the same temperature. Three- and four-tier racks, sunny windows and heaters should be avoided.
- A reliable charger with a voltage regulation of about 0.5% in the floating range is needed. The proper selection of float voltage is important.
- For maintenance, regularly scheduled voltage and temperature readings are useful in avoiding trouble and anticipating difficulties which might affect the reliability of the battery.
- Regular inspection of the water level, cleaning the terminals and connectors is good preventive maintenance. Water additions are normally required every three to six months for lead-antimony batteries and only every three to five years for lead calcium batteries.

ELECTROLYTE SPECIFIC GRAVITY VARIES WITH TEMPERATURE

Electrolyte Level	Specific Gravity at Electrolyte Temperatures		
	62°F	77°F	92°F
Full	1.215	1.210	1.205
1" low	1.230	1.225	1.205
½" low	1.245	1.240	1.235

Product News



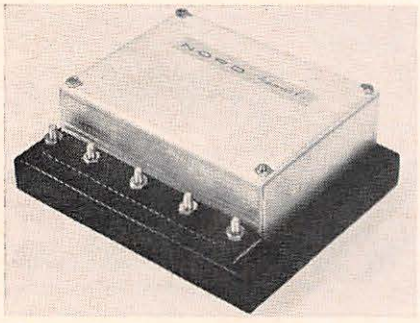
Insulated joint uses adhesive bond (101)

A new adhesive-bonded insulated joint, designed for use in continuous welded rail, has been introduced to the North American railroad market. More than 200,000 of these joints have been installed during the past 15 years on European railroads.

Designated the I-bond insulated joint, it handles axle loads of 40 tons and longitudinal loads of more than 750,000 lb. All insulated components are of hardened material, resistant to heavy compression loads and have an electrical resistance of 240,000 ohms.

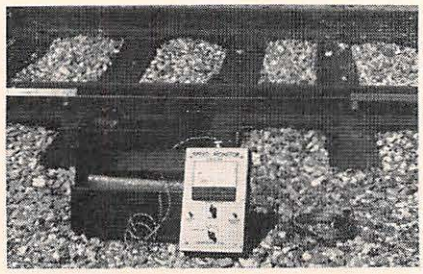
The end post is 5/32" thick to obtain minimum rail-end separation and thus reduce wheel batter to a negligible level. Electrical shorting because of material roll-over is controlled through a process of hardening rail-end surfaces. Special joint bars and high-strength bolts, precision tightened, hold the adhesive-bonded assembly permanently together.

The insulated joint is furnished factory-assembled in any tee-rail section in rail lengths of 10 ft, 11 ft and 13 ft, or longer upon request, which are then field-welded into the track or butt-welded at the welding plant. Special anchoring protection is not required. *Intma International, Inc.*



Solid-state selector fits WE type (102)

A new solid-state selector is a direct replacement for the WE 60 AP selector. The new solid-state selector operates in the same manner using a counter in place of the code wheel. As the incoming pulse train is received, the counter advances until there is a pause in the incoming pulse train. If a plug-in pin is in place at this stage of the counter, it will hold off reset and the counter can then advance to home position. All other selectors on the dispatcher's line will have reset and cannot reach home position with the remaining pulses. *Nord Instruments Co., Inc.*



Speed monitor is portable (103)

The Gulton portable, battery-operated speed monitor, type EMSE 268, has been developed to check the speed of any passing car or train and thus used to regulate humping speeds, for example, or any other necessary speed limits. Two speed ranges are available, either 2 to 20 mph, or 10 to 100 mph.

Suitably spaced switches, magnetically attached to one rail, detect the passage of car wheels and furnish control signals to the meter-computer box which uses solid state circuitry to compute speeds shown on a meter. Operation is not affected by the direction of car movement. An electrical output signal is available for recording speeds, when necessary, on any standard strip chart recorder. *Gulton Industries, Inc.*

Distributed computers used in yards (104)

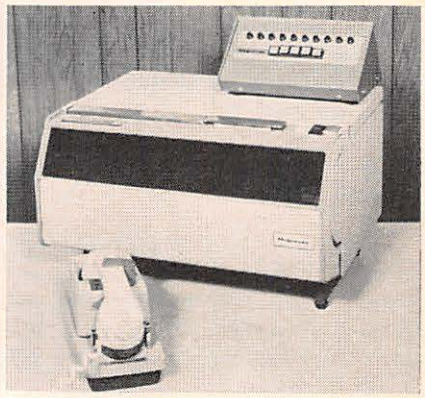
The Distributed Computer System can be used in car classification yards, interlocking consolidations, centralized traffic control and also for data acquistion and information on retrieval. The central processing unit is a mini-computer. It is combined with interface modules to perform specific assignments, such as collecting and displaying OS data, controlling car retarders automatically, etc.

In a large facility, several minicomputers with their associated interfaces, may be distributed to perform various functions with optimum efficiency. All units, minicomputers and interfaces are plug-in modules, comprise principally of plug-in circuit boards. *General Railway Signal Co.*

Switch lamp has brass housing (105)

The No. 155 Terne plate steel reflex switch lamp with four 5⅜" lenses (with or without stone guards) can be used in areas where no internal lighting is required. This reflex switch lamp is sealed in a brass housing.

The No. 425 electric cast aluminum switch lamp has four 5⅜" lenses. The adaptor eliminates shock and provides light adjustment for proper focus. *Handlan-Buck Co.*



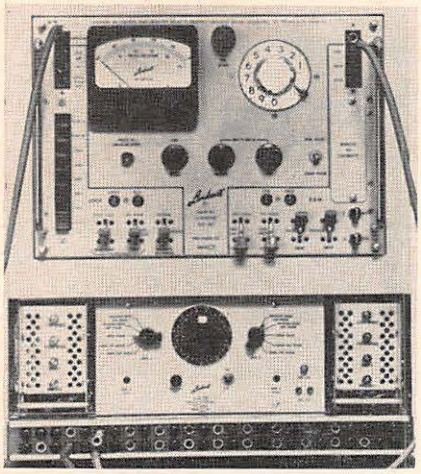
Facsimile has multi-station call (106)

Three new facsimile accessories offer increased automation in transmitting documents by telephone. The broadcaster enables a Magnafax facsimile unit to simultaneously transmit copy to a number of satellite stations. The auto-dialer and poller permit a central station to automatically poll up to twenty pre-selected telephone numbers to send or receive copy. Both operations can be performed without the attendance of an operator which enables the systems to be used after regular business hours when reduced telephone rates are in effect. *Magnavox Systems, Inc.*

Tone coders work on phone signaling (107)

A series of dual tone decoders for use in telephone signaling are standard for 1 digit, 2 digit and 3 digit operation. The input is designed for party line operation and has inbuilt noise

and voice secure circuits. The unit can be used bridging or terminating. These decoders have 'C' type contacts at the output. Alternative outputs or special applique circuits can be supplied to customer requirements. *Bayly Engineering Ltd.*



Test set is for E&M signaling (108)

The 26600 signaling test set is designed to test and monitor both E and M signaling and loop-dial facilities, either physical or carrier derived. The test set provides facilities for controlled pulse generation, measurement of pulse speed and ratio, and supervisory lamps for busy circuit monitoring.

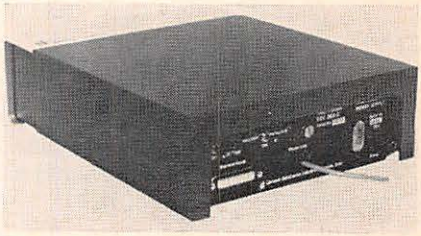
For E and M testing the 26600 measures any pulsing arrangement by activating simple toggle switches. For loop-dial testing, push button and central office battery. Calibration may be performed quickly and easily by removing a small plate on the front of toggle switches introduce the "loop" and "leak" conditions.

Power requirement is a 48-volt DC the panel. *GTE Lenkurt, Inc.*

Many scanners work off one decoder (109)

For applications where three or more automatic car identification scanners are located in a cluster, generally within a 1,000-foot radius of a control point, an automatic decoder selector switch option minimizes the number of decoders required to process the scanner outputs. The total number of decoders required with this option is equal to the number of simultaneous moves expected over any combination of the tracks serviced by the scanners. The decoder selector automatically connects any scanner to any idle decoder. Scanners are activated and the decoder selection process is initiated by conventional train approach circuits.

Decoder outputs can be connected directly to a cpu via communication lines or to an intermediate buffer or concentrator, or to a local terminal. A scanner identification number can be generated with the message generator option to identify the active track, and to train direction input from the track circuits may be passed through the ADSS to provide direction information in the decoder output. *GTE Information Systems, Inc.*



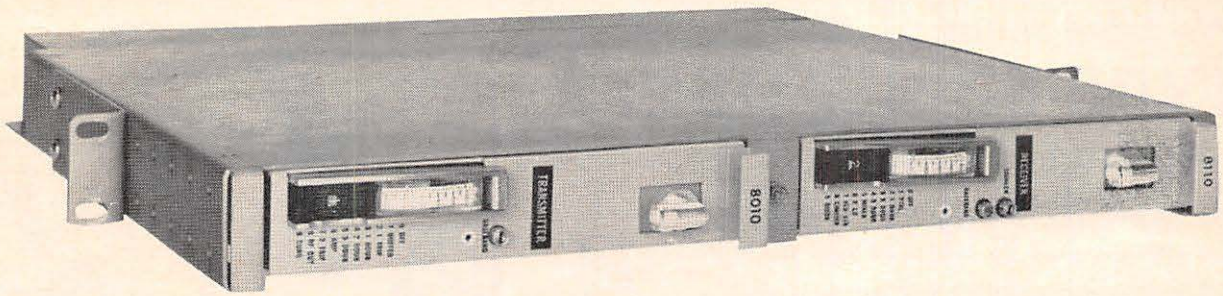
Modem operates on medium speed (110)

The GDC 202-3 modem is a medium-speed, synchronous modem that transmits and receives binary, serial

(Please turn to page 38)

system 8000

MODEL 8005
LOW COST
960 MHz LINK



Here is the most economical solution to the problem of replacing a short 450 MHz control link for a remote base station, particularly if it is required to power the remote base, and its 960 MHz link, from 12 volts d.c.

The simple and extremely compact enclosure pictured above houses one Type 8010 RF Transmitter and one Type 8110 RF Receiver. Mounted on the rear shelf of the enclosure is either the solid-state voltage regulator alone, for primary power of 12 volts d.c., or the regulator plus a power transformer and rectifier for primary power of either 115 or 230 volts a.c., 50 to 60 Hz. Note that only one rack unit (1¾") of vertical space is required.

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Circle 12 on reader service card

PRODUCT NEWS

(Continued from page 37)

data at up to 1200 bps over switched network or up to 1800 bps over private lines. It is compatible with and designed to replace the WECO 202C and 202D data sets.

The GDC 202-3 modem operates 2-wire, half duplex on the switched telephone network via the manual data access arrangement CDT (100A) and either 2-wire, half duplex or 4-wire, full duplex on private lines. The GDC 2023 provides data transmission between all edp equipments with standard EIA RS-232C interfaces. Two switch controls and a single lighted indicator on the 202-3 provide complete performance assurance at your installation. *General DataComm Industries.*

I/O terminal makes cards and tape (111)

The Sycor model 340 terminal system generates cards (as well as tape cassettes) and transmits card data to an identical terminal at the next yard which automatically receives the data long before the train itself arrives.

Specific freightcar information contained in the carded data is used to generate waybills. Pertinent card data is automatically read and displayed on the cathode-ray tube, merged with other waybill information keyboarded through the Sycor terminal, and recorded on magnetic tape cassettes for subsequent transmission. After being checked on the cathode-ray tube display by the operator, waybills are printed out in hard copy through the terminal.

The Sycor terminal's format control program, stored on the format cassette, guides the operator from start to finish through easy-to-follow, field-by-field labeling displayed on the CRT. The format program also detects errors, signals them through an audible alarm, and CRT visual display —and allows for easy correction just by re-keying.

The system consists of a terminal with a powerful pre-programmed microprocessor, combined with a variety of peripherals and half or full duplex communications capability. Units include: Keyboard—typewriter arrangement with control keys; Cathode-ray Tube (CRT)—512 character display of all keyed data; Cassettes—format and data cassettes, capacity of 200,000 characters; Printer—30 characters per second impact printer, up to 132 columns with 6 copies on continuous forms; Cardpunch—25 characters per second interpreting punch of standard 80 column cards; Cardreader—up to 250 cards per minute, 300 card hopper; Communication—75 to 1200 bit/second, half or full duplex; Interface—direct dial or polled. *Sycor Inc.*

Selectors work on data systems (112)

The Telemat universal selectors provide control sensing and switching facilities for all commonly used codes of data transmission. The design concept is of a universal type and allows for the final programming to be completed by the user without wiring changes. Four operating speeds of up to 2400 bauds are available as standard strapping options and most programing can be completed by U-link insertion on a program matrix board. Using this approach, most network requirements can be met by employing only one type of universal selector, for 5-level Baudot and 8-level ASCII codes. This equipment is suitable for controlling a great variety of business machines, including teleprinters, tape drives, card punches, card readers, CRTs etc. *Kameco Eelectronics Inc.*

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TYPE 52 HEADSETS

parts, too . . . . . .

They're the popular one-piece and fully adjustable transmitter-receiver sets for high efficiency, plus comfort. We can furnish Type 52-AW, 52-BW, or 52-DW sets . . . with Type L4AG, L4AH, or L4AK cords . . . 289-B or 310-A single or double prong plugs . . . HC3 300 ohm, or HC4 600 ohm receiver units. Parts are interchangeable with those of Western Electric sets.

Write for Bulletin 665-A and Price List.

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Type 53 Headsets also available.

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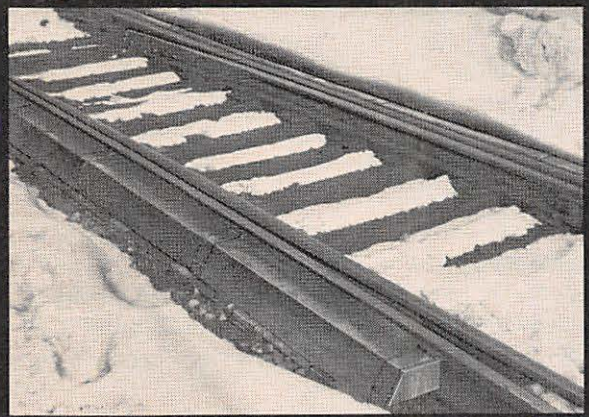
Vapor Sno Gard Switch Heaters keep switches clear of ice and snow



Get "all winter" relief from snow clogged and frozen switch problems by ordering Sno Gard Switch Heaters now. They keep switches operating, prevent switch rods from freezing. Duo-Jet Burner keeps Sno Gard Switch Heaters from smothering or blowing out. Operate manually or automatically on propane or natural gas. Simple to install — no permanent connection on track.

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Circle 14 on reader service card

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Tokenless Block
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Points and Signal Machines
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Solid state safety relays
ELECTRONIC TRACK CIRCUITS
Mechanical, Electromechanical and Electronic Operation of all Safety and Signalling Equipment.

JS - 305

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Circle 15 on reader service card

Editor's Corner

Increased usage seen for minicomputers

"Just as the 1960s was the decade of rapidly growing computer capacity, so the 1970s will be the decade of growth in computer accessibility. The physical delivery of information to or from a large central computer is too slow and disruptive to permit such a system to become a truly integral part of human decision making. To be highly effective, access must be available at normal work stations and offices. Such direct access will improve efficiency in various departments of an organization and will permit true man-machine interfaces to develop," wrote Dr. Andrew C. Gross, assistant professor of business administration at Cleveland State University, in the Nov. 15, 1971 issue of DATAMATION.

"Greater access can be provided to potential users by purchasing small computers, by acquiring terminals tied to medium-size central processors, or by having terminals hooked to intermediate communication equipment which in turn is connected to large computers," Gross wrote.

He defined small computers as those whose mainframes cost $25,000 to $100,000 in 1970 where the usual word length is from 8 to 32 bits, and the usual memory range is from 4k to 32k words. Minicomputers are those whose mainframe costs are below $25,000, where word length is 8 to 18 bits, and memory is at least 4k words.

RAILROADS GO FOR MINI-CPUS

At Illinois Central's intermodal exchange (IMX) or piggyback terminal in Chicago, is a practical application of interfacing man to the computer. Here, using teleprinters and a CRT keyboard-display unit, clerks and dispatchers are using a mini-computer sytsem for their daily operations. ACI scanners identify trailers and flatcars of trains entering and leaving the terminal as well as trailers arriving and departing via the highway.

While visiting this terminal recently, I could not help but be favorably impressed with the smoothness of the operation and the ease with which personnel used the computer to assist them in their daily work. Here is a system that is truly real-time and on line. For example, the computer is programmed to provide a train loading plan. Use of the plan results in being able to process an inbound driver with a trailer at the gate in about two minutes. The inbound gate clerk using a teleprinter keyboard asks the computer for the trailer parking location. He receives an answer back immediately and so informs the driver. In some cases, he can give the driver instructions for picking up a trailer for delivery to a customer's dock at the same time. All this is accomplished in so short a time, the driver never leaves his tractor cab. (An article about this IC piggyback terminal control system will be published in next month's RAILWAY SYSTEM CONTROLS.)

Mini-computers are being used by several railroads, such as Canadian National and Peoria & Pekin Union for handling inputs from automatic car identification scanners, and providing outputs to feed directly to larger computers or teleprocessing systems.

YARD CONTROL TOO!

Union Pacific has been operating its East Los Angeles classification yard with a minicomputer system for about six months. The minicomputer handles automatic routing of cars, retarder speed control and provides inventory data on cars handled. (It is this month's cover story.)

Several roads, such as Burlington Northern and Southern are using "intelligent terminals" in their computer and teleprocessing networks. These input/output devices are built around a minicomputer to provide for formatting, editing, error-checking and detecting and correcting, etc.

Estimates are that up to 100,000 small or minicomputers will be manufactured annually by 1980. Indications are that railroads will be among the forefront of users of these devices. A few other applications come to mind, that indicate the broad potential for minicomputer usage by railroads. In addition to applications mentioned are for clearance determination for outsize loads, analyzing hotbox detector outputs, diesel oil analysis, engineering design applications, traffic and cost analysis programs. A minicomputer may well be the solution for handling specific problems or analyses where it would be impractical or uneconomic to do it by any other means.

May Christmas last forever!

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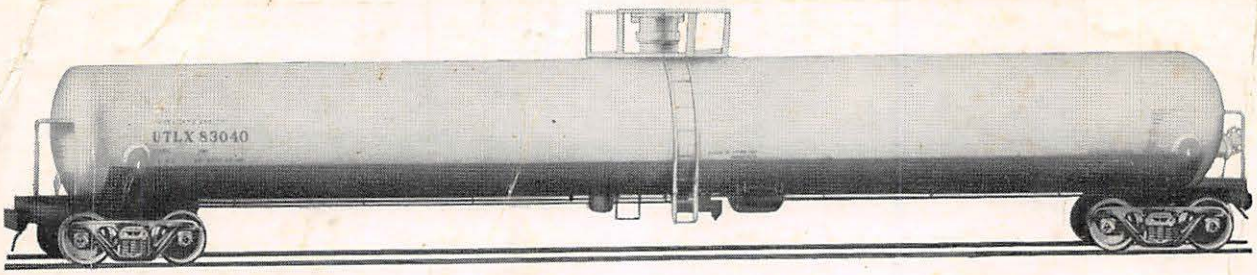

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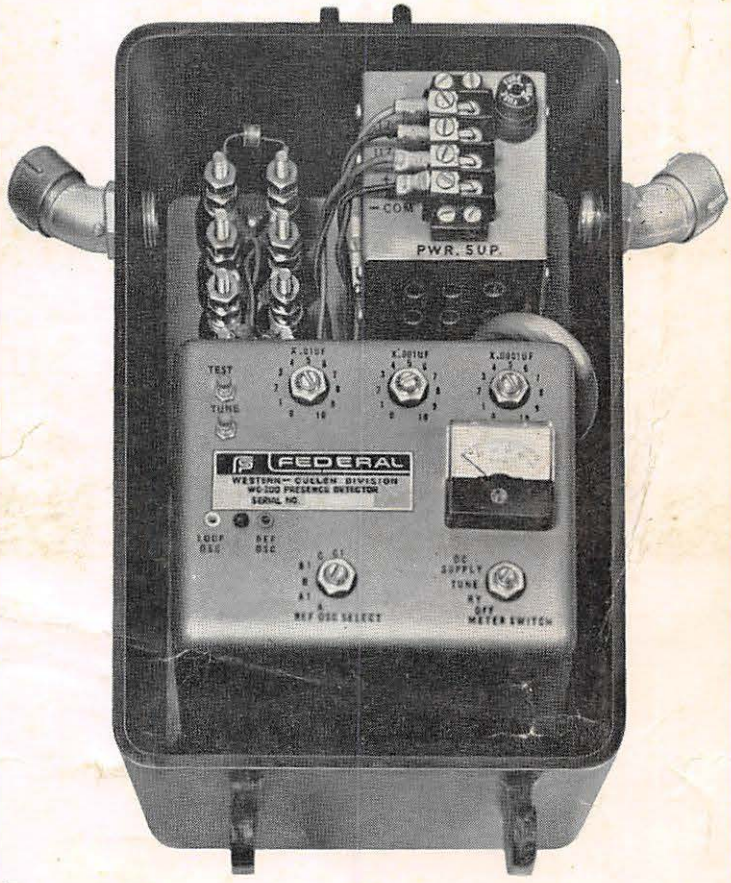

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